

CITY OF DOVER, NH



YEAR 1 MEASUREMENT & VERIFICATION REPORT Annual Contract Savings

(November 1, 2011 – October 31, 2012)

January 2013



CITY OF DOVER, NH

PERFORMANCE CONTRACT

Year 1 Annual M&V Report

Performance Period Dates Covered: November 1, 2011 to October 31, 2012

Contract #: 9236-0143

Contract Year #: 1

Annual Guaranteed Energy Savings: \$271,943

Annual O&M Savings: \$13,680

Annual Capital Cost Avoidance: \$33,840

Annual Guarantee: \$319,463

Contract Term: 10-Years

Term Guaranteed Savings: \$3,623,746

Utility Cost Avoidance Escalation Rate: 3.0%

Operations & Maintenance (O&M) Cost Avoidance Escalation Rate: 4.0%

Guarantee Start Date: 11/1/2011

Guarantee End Date: 10/31/2021



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EXECUTIVE SUMMARY

Cost Avoidance Summary

The City of Dover, NH and Johnson Controls, Inc. entered into a performance contract in September in 2009. The purpose of this contract is to lessen the energy and energy related costs realized by the City of Dover moving forward. The guaranteed savings portion of the contract (ten years) started on November 1 of 2011 and will end on October 31, 2021.

The original annual savings guarantee of \$304,510 includes \$256,990 in energy cost avoidance, \$13,680 in operations and maintenance (O&M) cost avoidance, and a future capital cost avoidance of \$33,840. This initial savings guarantee was increased from the original amount to \$319,463 due to Change Order (CO) # 9236-0142-CO2 which comprised of a lighting retrofit project at the McConnell Center. The annual guaranteed energy savings amount escalates by 3% and the O&M savings escalates by 4% each year to compensate for inflation. Total term benefits are \$3,623,746.

The following table summarizes the annual guaranteed savings by year vs. verified project savings:

| City of Dover Annual Cost Savings Summary | | | | | | |
|---|----------------------------------|-------------------------------|--|---------------------------------|--------------------------------|--------------------------|
| Guarantee Period | Guaranteed Energy Cost Avoidance | Guaranteed O&M Cost Avoidance | Guaranteed Future Capital Cost Avoidance | Total Guaranteed Cost Avoidance | Verified Annual Cost Avoidance | Variance |
| Year 1 | \$271,943 | \$13,680 | \$33,840 | \$319,463 | \$317,642 | (\$1,821) ⁽¹⁾ |
| Year 2 | \$280,169 | \$14,227 | \$33,840 | \$328,236 | | |
| Year 3 | \$288,644 | \$14,796 | \$33,840 | \$337,280 | | |
| Year 4 | \$297,375 | \$15,388 | \$33,840 | \$346,603 | | |
| Year 5 | \$306,371 | \$16,004 | \$33,840 | \$356,214 | | |
| Year 6 | \$315,638 | \$16,644 | \$33,840 | \$366,122 | | |
| Year 7 | \$325,186 | \$17,310 | \$33,840 | \$376,336 | | |
| Year 8 | \$335,023 | \$18,002 | \$33,840 | \$386,865 | | |
| Year 9 | \$345,157 | \$18,722 | \$33,840 | \$397,719 | | |
| Year 10 | \$355,598 | \$19,471 | \$33,840 | \$408,909 | | |
| Total | \$3,121,103 | \$164,244 | \$338,400 | \$3,623,746 | \$317,642 | N/A |

⁽¹⁾ Year 1 variance is due to non-installation of FIM 12- Power Factor Correction as explained in further sections of the report.

This report is designed to provide the first annual tracking point for the City of Dover in understanding the energy savings of this project. The following report details the status of this project, including guaranteed and verified savings for all Facility Improvement Measures (FIMs) involved.

This report covers the first full contract (guarantee) year which runs from November 2011 through October 2012. Dissimilar to savings in previous reports, this report tracks over the guarantee period only.

EXECUTIVE SUMMARY

Year 1 Summary

The project to date has performed well but there were several issues that have arisen over the course of contract year 1. This section is designed to summarize all of the major happenings as relates to the project & savings and discusses the subsequent actions that these items have on the project going forward. They have been laid out below by measure / building for easy reference.

Ice Arena – Power Factor Correction

The capacitors at the Ice Arena have not been installed. There was extreme difficulty obtaining correspondence from Carrier stating that the chiller warranty would not be affected by the introduction of the device. A letter was obtained from a Carrier representative in late 2012 and the units are scheduled for installation at the Ice Arena in early 2013. Future reports will discuss the updated installation information and savings for FIM 12.

Waste Water Treatment Plant – Odor Issues

With the implementation of the new aeration blowers as part of FIM 14, an activated carbon scrubber was installed in order to treat the “dirty” air being drawn from the mixing tanks in an effort to reduce / eliminate foul odor in the air. The blower which was drawing air from the tanks was set to run when the sludge was being mixed. This was problematic in that the concentrations of odiferous gasses in the tanks was building up during periods when the unit was not running. The highly concentrated gas was then overpowering the carbon and resulted in a foul smell at the plant. After some testing and communications with plant personnel and other industry experts, in early spring of 2012, JCI proposed a field correction and the blower was set to run full time. A silencer was added to the blower unit as to prevent any noise concerns from the surrounding community. There have been no major issues since the implementation of the new scheduling.

Public Works – VFD on Fan

As part of FIM 4, a variable frequency drive was placed on the HV-3 unit at the public works facility. It was intended to slow fan speed down based on occupancy and space setpoint to gain energy savings. However, there were initial issues with how the drive was hooked up the VFD was tripping out the system continuously. The system was partially set-up on exhaust for CO/NO as to keep the personnel in the maintenance area safe. By introducing the drive, there was a conflict in ventilation of harmful gasses as the unit was running solely on a call for heat and not based off gaseous concentrations. The idea of obtaining savings on one part of the system upset the balance of the overall system which cannot be easily corrected. In late summer of 2012, the drive was removed from the unit based off recommendations from site personnel and other parties. Additional work was performed by JCI to convert the system back to previous operation. The issues appear to be resolved at the time of this reporting. The savings for this measure will not be realized going forward but the guarantee will still contribute to the savings the city will achieve.

EXECUTIVE SUMMARY

Ice Arena – Ice Temperature Sensor

The Ice Arena received a new infrared temperature sensor which measures the temperature of the top of the ice which is a much more efficient way to keep the ice at proper temperature. However, the sensor was reading a bad value resulting in the ice chiller running more often than necessary. The sensor was replaced and the value was corrected. However, during replacement of the sensor, the JCI contractor switched the run mode of the building in the panel from auto to hand, resulting in the chiller compressors, floor and brine pumps to run full time and not cycle as scheduled through the setpoints and scheduling. The amount of energy used above and beyond the normal operation is estimated at about 15,000 kWh per month. It took several months of time for Ice Arena personnel to realize the status of the system was incorrect but was corrected as a result of a service call at the end of 2012. At last check, the new utility invoice which would show this re-correction was not available. This issue will be updated in additional project reporting.

McConnell Center – Lighting

As part of the ARRA funding, it was determined that as part of the lighting installation, there was a slight shortfall of ARRA funds with one part of the installation. JCI worked with Dover and in June of 2012 installed additional lighting sensors in place of the Green Beam Fixtures that were not installed. The savings realized are slightly more than the original fixture replacement savings and are accounted for in the reporting.

EXECUTIVE SUMMARY

Monthly Comparison

Cost savings are provided on a monthly basis for contract year in the table below. The annual guaranteed savings per Facility Improvement Measure (FIM) represents the amount per FIM that adds up to the total annual guarantee. FIM savings are not guaranteed individually; the savings guarantee reflects the whole project. Therefore deficiencies from one FIM can be overcome by another FIM to result in overall project savings. For the 1st contract year, JCI is reporting a verified total contractual savings of \$317,642 which does not include any savings resulting from FIM 12 which hasn't been fully installed due to existing equipment warranty requirements that needed to be sorted out. Additional information regarding this is contained in the upcoming pages of the report.

| City of Dover, NH | | | | | | | | | | | | | | | |
|-------------------------------|--|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|---------------------------|---------------------------|
| FIM # | FIM Description | Fiscal Year 2012 | | | | | | | | Fiscal Year 2013 | | | | Total Y1 Contract Savings | Annual Guaranteed Savings |
| | | NOV | DEC | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | | |
| 1 | Lighting - Fixture Retrofit | \$1,850 | \$1,807 | \$1,774 | \$1,672 | \$1,905 | \$1,898 | \$2,056 | \$2,106 | \$2,374 | \$2,353 | \$2,019 | \$2,020 | \$23,835 | \$22,402 |
| | Lighting Fixtures (McConnell Ctr) | \$821 | \$795 | \$779 | \$735 | \$846 | \$847 | \$924 | \$968 | \$1,130 | \$1,116 | \$913 | \$903 | \$10,776 | \$10,685 |
| 2 | Lighting - Fixture Control | \$511 | \$528 | \$528 | \$494 | \$528 | \$511 | \$528 | \$511 | \$528 | \$528 | \$511 | \$528 | \$6,240 | \$5,978 |
| | Lighting Controls (McConnell Ctr) ⁽³⁾ | \$351 | \$362 | \$362 | \$339 | \$362 | \$351 | \$362 | \$355 | \$386 | \$386 | \$374 | \$386 | \$4,377 | \$4,268 |
| 3 | Building Envelope - Weatherization | \$1,398 | \$1,985 | \$2,157 | \$1,952 | \$1,526 | \$1,223 | \$805 | \$185 | \$505 | \$508 | \$978 | \$1,241 | \$14,461 | \$14,461 |
| 4.1 | EMS - Building Controls | \$762 | \$1,217 | \$1,354 | \$1,215 | \$853 | \$624 | \$281 | \$152 | \$54 | \$56 | \$420 | \$611 | \$7,599 | \$8,398 |
| 4.2 | EMS - Building Controls / Optimal Start | \$186 | \$297 | \$331 | \$297 | \$208 | \$152 | \$68 | \$32 | \$0 | \$1 | \$57 | \$85 | \$1,713 | \$2,023 |
| 4.3 | AHU Upgrade - VFD on Fan ⁽⁴⁾ | \$550 | \$640 | \$663 | \$612 | \$591 | \$543 | \$507 | \$577 | \$788 | \$763 | \$325 | \$0 | \$6,560 | \$6,615 |
| 4.4 | Pool Dehumidification - EMS & VFD's | \$949 | \$981 | \$981 | \$918 | \$981 | \$949 | \$981 | \$949 | \$981 | \$981 | \$949 | \$981 | \$11,581 | \$11,203 |
| 4.5 | Repair Snow Melt Sensor | \$268 | \$554 | \$554 | \$518 | \$554 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$2,448 | \$2,357 |
| 6 | Water Conservation | \$1,198 | \$1,238 | \$1,238 | \$1,158 | \$1,238 | \$1,198 | \$1,238 | \$1,198 | \$1,238 | \$1,238 | \$1,198 | \$1,238 | \$14,611 | \$14,123 |
| 9 | Vending Machine Controllers | \$80 | \$82 | \$82 | \$77 | \$82 | \$80 | \$82 | \$80 | \$82 | \$82 | \$80 | \$82 | \$971 | \$936 |
| 10 | Pool Covers | \$1,120 | \$1,158 | \$1,158 | \$1,083 | \$1,158 | \$1,120 | \$1,158 | \$1,120 | \$1,158 | \$1,158 | \$1,120 | \$1,158 | \$13,669 | \$13,223 |
| 11 | Ice Arena Upgrades ⁽⁵⁾ | \$4,987 | \$5,200 | \$4,326 | \$3,301 | \$5,543 | \$5,863 | \$6,252 | \$14,601 | \$17,340 | \$12,787 | \$12,359 | \$6,454 | \$99,014 | \$95,015 |
| 12 | Power Factor Correction | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$7,188 |
| 13 | Energy Efficient Transformers | \$1,313 | \$1,357 | \$1,357 | \$1,270 | \$1,357 | \$1,313 | \$1,357 | \$1,313 | \$1,357 | \$1,357 | \$1,313 | \$1,357 | \$16,024 | \$15,430 |
| | E.E. Transformers (Ice Arena) | \$233 | \$240 | \$240 | \$226 | \$240 | \$233 | \$240 | \$233 | \$240 | \$240 | \$233 | \$240 | \$2,835 | \$2,955 |
| 14 | Aeration Blower Upgrade ⁽²⁾ | \$2,833 | \$2,927 | \$2,927 | \$2,738 | \$2,820 | \$2,511 | \$2,595 | \$2,511 | \$2,595 | \$2,595 | \$2,511 | \$2,595 | \$32,158 | \$33,432 |
| 15 | Boiler Replacement | \$130 | \$207 | \$230 | \$207 | \$145 | \$53 | \$0 | \$0 | \$0 | \$0 | \$91 | \$189 | \$1,251 | \$1,251 |
| ENERGY COST SAVINGS | | \$19,540 | \$21,577 | \$21,041 | \$18,812 | \$20,938 | \$19,469 | \$19,432 | \$26,892 | \$30,756 | \$26,148 | \$25,451 | \$20,066 | \$270,122 | \$271,943 |
| O&M Cost Avoidance | | \$1,121 | \$1,159 | \$1,159 | \$1,084 | \$1,159 | \$1,121 | \$1,159 | \$1,121 | \$1,159 | \$1,159 | \$1,121 | \$1,159 | \$13,680 | \$13,680 |
| Future Capital Cost Avoidance | | \$2,774 | \$2,866 | \$2,866 | \$2,681 | \$2,866 | \$2,774 | \$2,866 | \$2,774 | \$2,866 | \$2,866 | \$2,774 | \$2,866 | \$33,840 | \$33,840 |
| TOTAL COST SAVINGS | | \$23,435 | \$25,602 | \$25,066 | \$22,577 | \$24,962 | \$23,364 | \$23,457 | \$30,787 | \$34,781 | \$30,172 | \$29,346 | \$24,091 | \$317,642 | \$319,463 |

⁽²⁾ Additional blower unit was installed and scheduled to run full time at the WWTP beginning in March 2012 as part of FIM 14 to alleviate odor issues encountered

⁽³⁾ Additional lighting controls installed at the McConnell Center beginning in June 2012 were installed to replace savings for uninstalled lighting fixtures

⁽⁴⁾ The VFD as part of FIM 4.3 at the Public Works building was removed in September 2012 from the AHU due to continued system compatibility issues encountered over the life of the project.

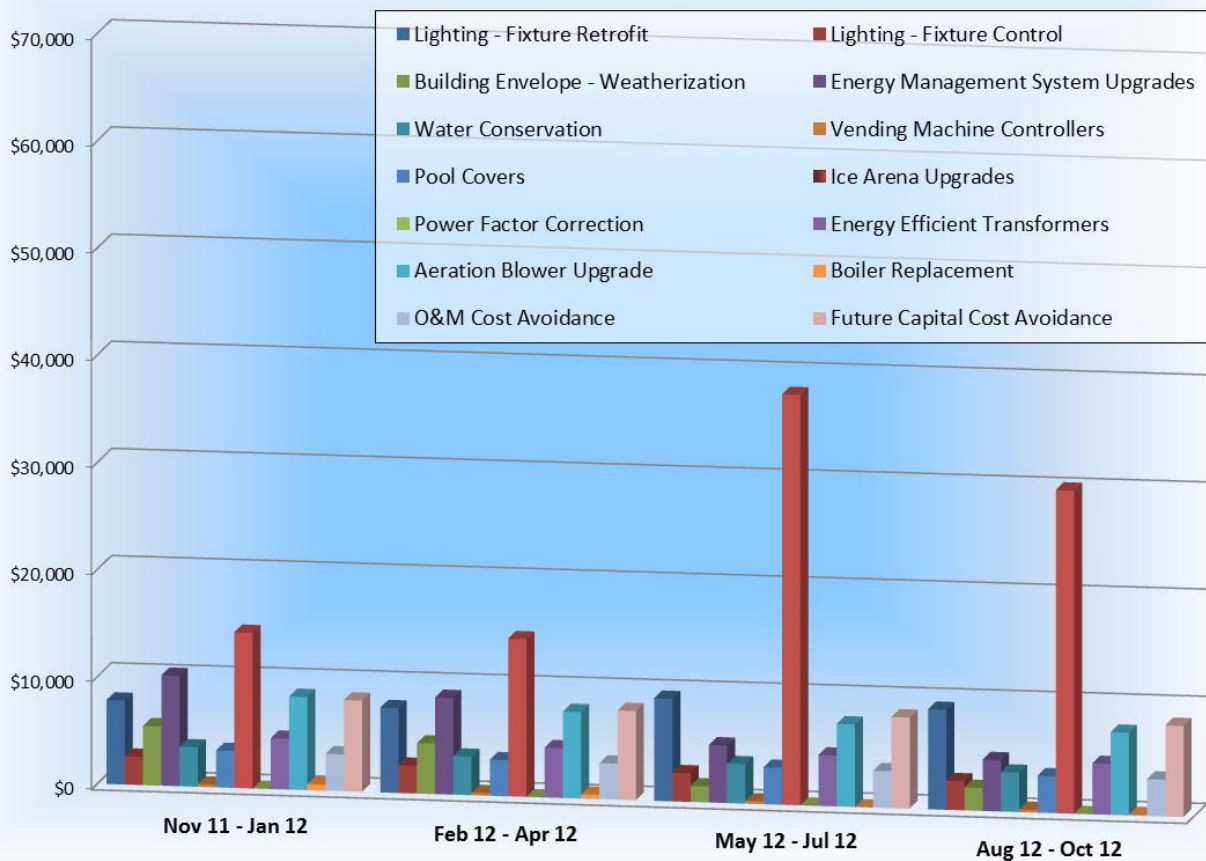
⁽⁵⁾ Total Monthly Savings contains \$8,791 cost of Icemax for FIM 11- Ice Arena Upgrades

EXECUTIVE SUMMARY

Total Contract Year 1 Savings

Savings realized by the project during Contract Year 1 totals 864,258 kWh & 2,120 kW (\$105,925), 12,360 MMBTU's (\$159,910) and 1,184 kGals of water/ sewer savings (\$13,078). Operation and maintenance (O&M) savings and capital cost avoidance stipulated in the performance contract totals \$47,520. FIM 11 Icemax costs are \$8,791. Therefore, the total contract year savings are broken down by FIM below and amount to \$317,642 compared to the Year 1 guaranteed savings of \$319,463. No savings from FIM 12 have been realized as of the close of Year 1.

Guarantee Year 1 Cost Savings: City of Dover

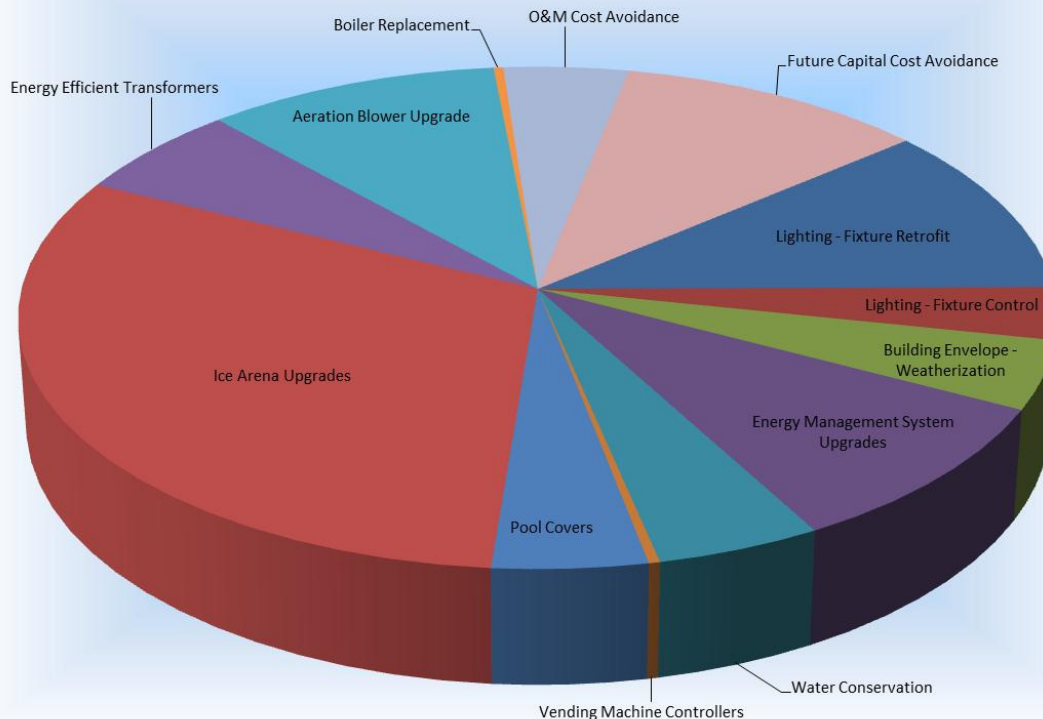


Thermal Savings consist of savings from Natural Gas (therms), Oil (gallons), and Propane (gallons). In order to provide a basis for comparison, these have all been reported in MMBtu. Conversion factors used in assembling this report are listed below:

- Natural Gas: 1 therm = 0.1 MMBtu
- Oil: 1 gallon = 0.139 MMBtu
- Propane: 1 gallon = 0.0916 MMBtu

EXECUTIVE SUMMARY

Guarantee Year 1 Cost Savings: City of Dover



City of Dover, NH - Guarantee Year 1 Savings

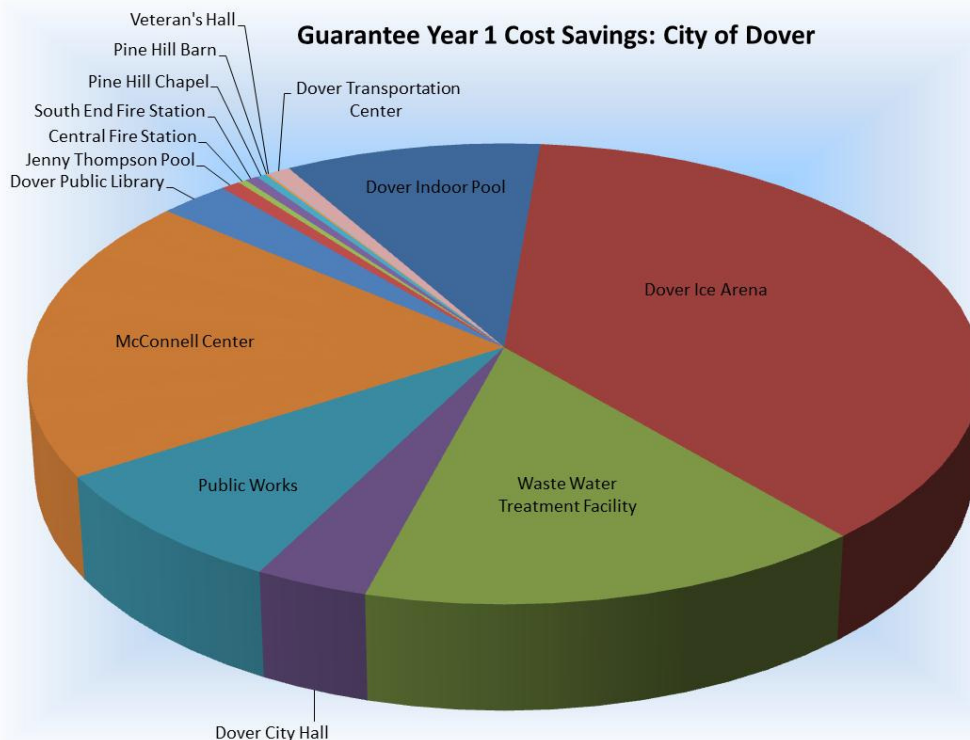
| FIM # | FIM Description | Electricity Savings | | | Thermal Savings | | Water Savings | | Total Year 1 \$ Savings |
|-------------------------------|---------------------------------|---------------------|----------------|------------------|-----------------|------------------|---------------|-----------------|-------------------------|
| | | kW | kWh | \$ | MMBtu | \$ | kgal | \$ | |
| 1 | Lighting - Fixture Retrofit | 1,426 | 262,950 | \$37,173 | (192) | (\$2,562) | 0 | \$0 | \$34,610 |
| 2 | Lighting - Fixture Control | 310 | 91,690 | \$10,617 | 0 | \$0 | 0 | \$0 | \$10,617 |
| 3 | Bldg. Envelope - Weatherization | 0 | 4,838 | \$530 | 1,009 | \$13,932 | 0 | \$0 | \$14,461 |
| 4 | EMS -Upgrades | 0 | 129,238 | \$14,860 | 1,056 | \$15,042 | 0 | \$0 | \$29,901 |
| 6 | Water Conservation | 0 | 0 | \$0 | 164 | \$2,245 | 1,120 | \$12,366 | \$14,611 |
| 9 | Vending Machine Controllers | 0 | 8,448 | \$971 | 0 | \$0 | 0 | \$0 | \$971 |
| 10 | Pool Cover | 0 | 46,784 | \$4,889 | 561 | \$8,069 | 64 | \$712 | \$13,669 |
| 11 | Ice Arena - Upgrades | (674) | (92,132) | (\$14,130) | 9,673 | \$121,935 | 0 | \$0 | \$107,805 |
| 12 | Power Factor Correction | 0 | 0 | \$0 | 0 | \$0 | 0 | \$0 | \$0 |
| 13 | Energy Efficient Transformers | 318 | 151,041 | \$18,858 | 0 | \$0 | 0 | \$0 | \$18,858 |
| 14 | Aeration Blower Upgrade | 739 | 261,402 | \$32,158 | 0 | \$0 | 0 | \$0 | \$32,158 |
| 15 | Boiler Replacement | 0 | 0 | \$0 | 88 | \$1,251 | 0 | \$0 | \$1,251 |
| Energy Totals | | 2,120 | 864,258 | \$105,925 | 12,360 | \$160,222 | 1,184 | \$13,078 | \$278,913 |
| Ice Arena IceMax Cost | | - | - | - | - | - | - | - | (\$8,791) |
| O&M Cost Avoidance | | - | - | - | - | - | - | - | \$13,680 |
| Future Capital Cost Avoidance | | - | - | - | - | - | - | - | \$33,840 |
| Totals | | 2,120 | 864,258 | \$105,925 | 12,360 | \$159,910 | 1,184 | \$13,078 | \$317,642 |

EXECUTIVE SUMMARY

Savings per Facility

| City of Dover, NH – Guarantee Year 1 Savings | | | | | | | | | |
|--|---------------------|----------------|------------------|-----------------|------------------|---------------|-----------------|------------------------|------------------|
| Facility Location | Electricity Savings | | | Thermal Savings | | Water Savings | | O&M / Cap Cost Savings | Total \$ Savings |
| | kW | kWh | \$ | MMBtu | \$ | kgal | \$ | | |
| Central Fire Station | 0 | 176 | \$22 | 47 | \$722 | 21 | \$229 | \$0 | \$973 |
| Dover City Hall | 150 | 36,014 | \$4,486 | 163 | \$2,718 | 303 | \$3,346 | \$480 | \$11,030 |
| Dover Ice Arena | (415) | 2,641 | (\$2,660) | 10,046 | \$126,651 | 239 | \$2,643 | ⁽⁶⁾ \$2,489 | \$129,123 |
| Dover Public Library | 102 | 34,296 | \$4,613 | 170 | \$2,400 | 128 | \$1,409 | \$480 | \$8,902 |
| Dover Transportation Ctr. | 0 | 20,051 | \$2,448 | 0 | \$0 | 0 | \$0 | \$0 | \$2,448 |
| Indoor Pool | 37 | 124,004 | \$13,279 | 1,006 | \$14,460 | 280 | \$3,097 | \$34,320 | \$65,157 |
| Jenny Thompson Pool | 0 | 0 | \$0 | 25 | \$320 | 141 | \$1,559 | \$0 | \$1,878 |
| McConnell Center | 821 | 166,919 | \$23,754 | 418 | \$5,894 | 0 | \$0 | \$480 | \$30,129 |
| Pine Hill Barn | 0 | 0 | \$0 | 21 | \$354 | 0 | \$0 | \$0 | \$354 |
| Pine Hill Chapel | 0 | 21 | \$4 | 38 | \$639 | 7 | \$72 | \$0 | \$715 |
| Public Works | 571 | 179,077 | \$22,911 | 267 | \$3,021 | 56 | \$624 | \$480 | \$27,036 |
| South End Fire Station | 0 | 85 | \$11 | 81 | \$1,438 | 9 | \$99 | \$0 | \$1,548 |
| Veterans Hall | 0 | 0 | \$0 | 16 | \$280 | 0 | \$0 | \$0 | \$280 |
| Waste Water Treatment Facility | 853 | 300,973 | \$37,056 | 61 | \$1,013 | 0 | \$0 | \$0 | \$38,069 |
| Totals | 2,120 | 864,258 | \$105,925 | 12,361 | \$159,910 | 1,184 | \$13,078 | \$38,729 | \$317,642 |

⁽⁶⁾ Total O&M / Capital Cost Savings contains \$8,791 cost of Icemax for FIM 11- Ice Arena Upgrades



EXECUTIVE SUMMARY

Total project cost savings for Guarantee Year 1 are broken down by building and by FIM in the table below.

| City of Dover, NH Building Location | FIM 1 | FIM 2 | FIM 3 | FIM 4 | FIM 6 | FIM 9 | FIM 10 | FIM 11 | FIM 12 | FIM 13 | FIM 14 | FIM 15 | O&M Savings / Capital Cost Avoidance | Totals / Building |
|--|-------------------|-------------------|---------------------------------------|--|--------------------|--------------------------------|-----------------|-----------------------|----------------------------|----------------------------------|----------------------------|--------------------|---|-------------------|
| | Lighting Fixtures | Lighting Controls | Building Envelope (Weatherization) | Energy Management System - Upgrades | Water Conservation | Vending Machine Controllers | Pool Cover | Ice Arena Upgrades | Power Factor Correction | Energy Efficient Transformers | Aeration Blower Upgrade | Boiler Replacement | | |
| Central Fire Station | | | \$693 | | \$281 | | | | | | | | | \$973 |
| Dover City Hall | \$2,954 | \$965 | \$900 | \$1,713 | \$3,691 | \$327 | | | | | | | \$480 | \$11,030 |
| Dover Ice Arena | \$5,762 | \$1,382 | \$5,221 | | \$3,311 | \$318 | | \$107,805 | \$0 | \$2,835 | | | ⁽⁷⁾ \$2,489 | \$129,123 |
| Dover Public Library | \$3,464 | \$956 | \$341 | \$854 | \$1,558 | | | | | | | \$1,251 | \$480 | \$8,902 |
| Dover Transportation Ctr. | | | | \$2,448 | | | | | | | | | | \$2,448 |
| Indoor Pool | \$1,233 | \$27 | \$1,083 | \$11,753 | \$2,915 | \$157 | \$13,669 | | | | | | \$34,320 | \$65,157 |
| Jenny Thompson Pool | | | | | \$1,878 | | | | | | | | | \$1,878 |
| McConnell Center | \$10,776 | \$4,377 | \$981 | \$5,928 | | | | | | \$7,587 | | | \$480 | \$30,129 |
| Pine Hill Barn | | | | \$354 | | | | | | | | | | \$354 |
| Pine Hill Chapel | | | \$448 | \$187 | \$79 | | | | | | | | | \$715 |
| Public Works | \$10,422 | \$2,910 | \$2,067 | \$6,664 | \$764 | \$168 | | | | \$3,560 | | | \$480 | \$27,036 |
| South End Fire Station | | | \$1,413 | | \$135 | | | | | | | | | \$1,548 |
| Veterans Hall | | | \$280 | | | | | | | | | | | \$280 |
| Waste Water Treatment Facility | | | \$1,034 | | | | | | | \$4,876 | \$32,158 | | | \$38,069 |
| Totals / FIM | \$34,610 | \$10,617 | \$14,461 | \$29,901 | \$14,611 | \$971 | \$13,669 | \$107,805 | \$0 | \$18,858 | \$32,158 | \$1,251 | \$38,729 | \$317,642 |

⁽⁷⁾ Ice Arena & FIM 11 Savings contains \$8,791 cost of Icemax as part of O&M Savings.

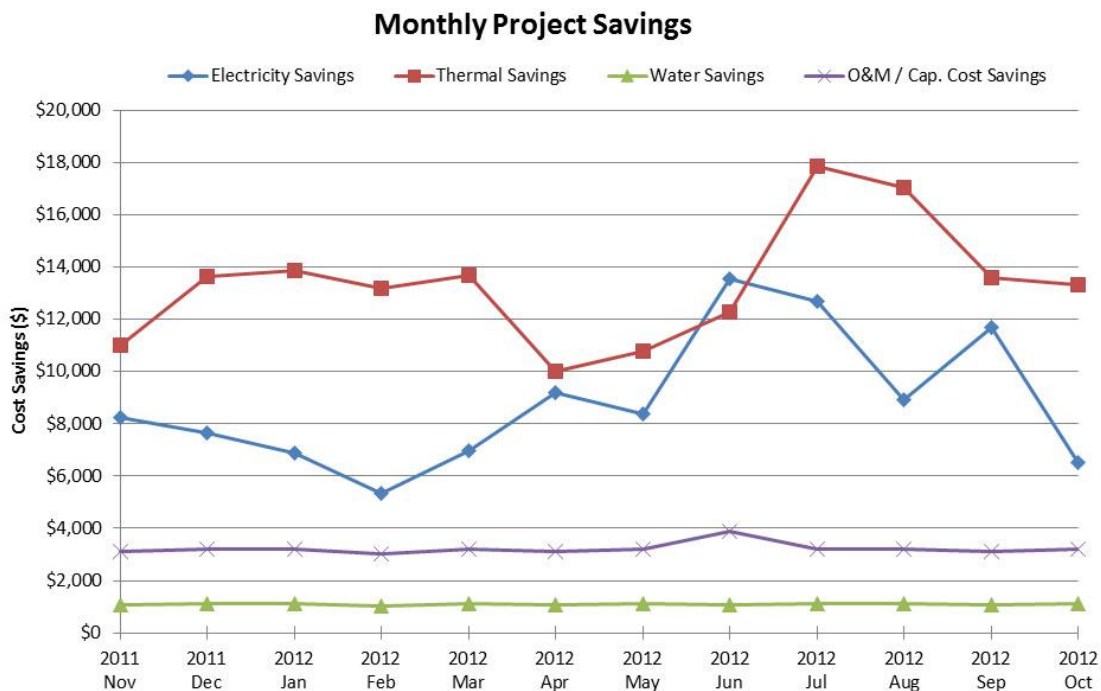
EXECUTIVE SUMMARY

Aggregate Monthly FIM Savings

Included below are the total monthly energy unit savings and associated dollar cost savings for all FIMs.

| City of Dover- Performance Contract Savings | | | | | | | | | | |
|---|------|------------------|----------------|------------------|-----------------|------------------|---------------|-----------------|--|-----------------------|
| Guarantee Year 1 Energy Cost Avoidance | | | | | | | | | | |
| Month | Year | Electric Savings | | | Thermal Savings | | Water Savings | | O&M / Cap. Cost Savings ⁽⁸⁾ | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | MMBtu | Cost \$ | kGal | Cost \$ | | |
| November | 2011 | 158 | 68,367 | \$8,250 | 838 | \$11,003 | 97 | \$1,072 | \$3,110 | \$23,451 |
| December | 2011 | 164 | 61,242 | \$7,627 | 1,036 | \$13,654 | 100 | \$1,108 | \$3,214 | \$25,619 |
| January | 2012 | 118 | 57,358 | \$6,883 | 1,049 | \$13,861 | 100 | \$1,108 | \$3,214 | \$25,083 |
| February | 2012 | 128 | 42,865 | \$5,355 | 1,002 | \$13,180 | 94 | \$1,036 | \$3,007 | \$22,600 |
| March | 2012 | 159 | 54,990 | \$6,975 | 1,049 | \$13,665 | 100 | \$1,108 | \$3,214 | \$25,098 |
| April | 2012 | 180 | 75,711 | \$9,177 | 766 | \$10,005 | 97 | \$1,072 | \$3,110 | \$23,719 |
| May | 2012 | 220 | 64,746 | \$8,351 | 835 | \$10,785 | 100 | \$1,108 | \$3,214 | \$23,457 |
| June | 2012 | 198 | 115,476 | \$13,551 | 957 | \$12,269 | 97 | \$1,072 | \$3,895 | \$30,787 |
| July | 2012 | 212 | 104,999 | \$12,665 | 1,404 | \$17,794 | 100 | \$1,108 | \$3,214 | \$34,781 |
| August | 2012 | 218 | 69,224 | \$8,909 | 1,337 | \$16,942 | 100 | \$1,108 | \$3,214 | \$30,172 |
| September | 2012 | 180 | 99,064 | \$11,661 | 1,056 | \$13,503 | 97 | \$1,072 | \$3,110 | \$29,346 |
| October | 2012 | 187 | 50,217 | \$6,520 | 1,030 | \$13,249 | 100 | \$1,108 | \$3,214 | \$24,091 |
| Contract Year 1 | | 2,120 | 864,258 | \$105,925 | 12,360 | \$159,910 | 1,184 | \$13,078 | \$38,729 | \$317,642 |

⁽⁸⁾ Icemax Cost from FIM 11 included in O&M column in this chart



FIM DESCRIPTION

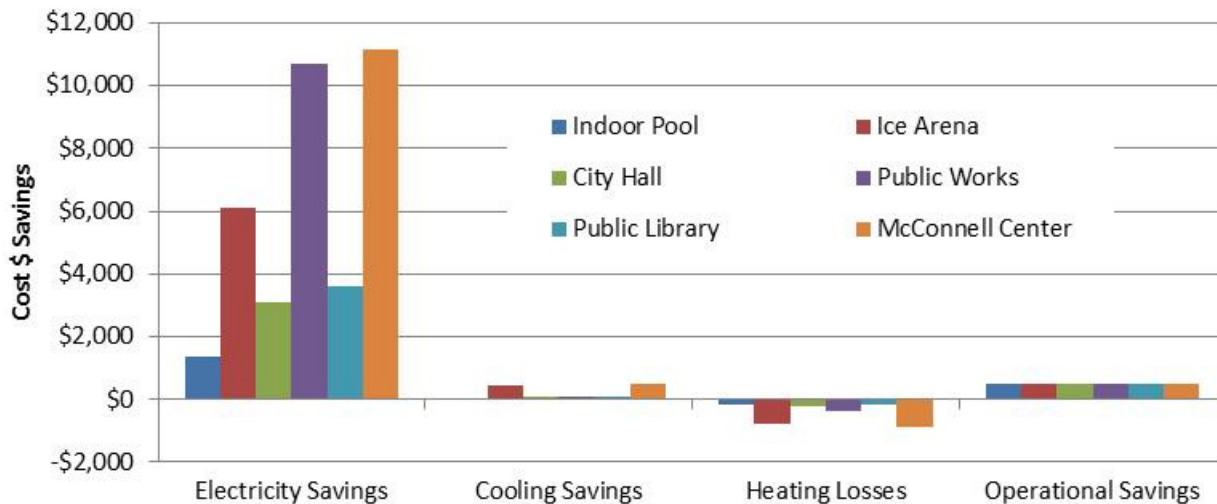
FIM 1: Lighting – Fixture Retrofit

Lighting can be broken down into four savings parts: Electricity Savings from the replacement of higher power fixtures with more efficient ones, Cooling Savings from less fixture heat being introduced into a cooled space, Heating Losses from less fixture heat being introduced in a heated space, and Operational Savings from decreased lighting changes and uniform lighting stock. Annual guaranteed electric savings associated with FIM 1 are 262,508 kWh with a monthly reduction in demand of 118.8 kW. Annual guaranteed heating losses are calculated to be 233 MMBtu resulting in a total guaranteed energy cost savings for FIM 1 of \$33,086. Operational Savings are stipulated at \$2,880 for the first contract year for this measure as outlined in the contract.

| FIM 1: Lighting – Fixture Retrofit | | | | | | | | | |
|--------------------------------------|---------------------|----------------|-----------------|-----------------|----------------|----------------|------------------|----------------|-----------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | | |
| Building | Electricity Savings | | | Cooling Savings | | Heating Losses | | O&M | Total Cost |
| | kW | kWh | Cost \$ | kWh | Cost \$ | MMBtu | Cost \$ | \$ Savings | \$ Savings |
| Indoor Pool | 36 | 10,111 | \$1,378 | 76 | \$8 | (11) | (\$153) | \$480 | \$1,713 |
| Ice Arena | 142 | 47,937 | \$6,090 | 4,259 | \$451 | (62) | (\$779) | \$480 | \$6,242 |
| City Hall | 88 | 24,784 | \$3,087 | 733 | \$91 | (13) | (\$224) | \$480 | \$3,434 |
| Public Works | 382 | 83,533 | \$10,687 | 734 | \$94 | (32) | (\$359) | \$480 | \$10,902 |
| Public Library | 102 | 26,681 | \$3,589 | 480 | \$65 | (13) | (\$189) | \$480 | \$3,944 |
| McConnell Center ⁽⁹⁾ | 675 | 59,097 | \$11,147 | 4,524 | \$485 | (61) | (\$857) | \$480 | \$11,256 |
| Totals | 1,426 | 252,144 | \$35,978 | 10,806 | \$1,195 | (192) | (\$2,562) | \$2,880 | \$37,490 |

⁽⁹⁾ McConnell Center included into scope with FIM 1 due to CO # 9236-0142-CO2

FIM 1: Year 1 Savings



Verified savings are obtained from calculations and verified by measurements of circuit kW on a sample of lighting circuits before and after the retrofit was implemented. Calculation equations have been provided in Appendix C for reference. Hours of operation are stipulated for the contract term as per the contract.

FIM DESCRIPTION

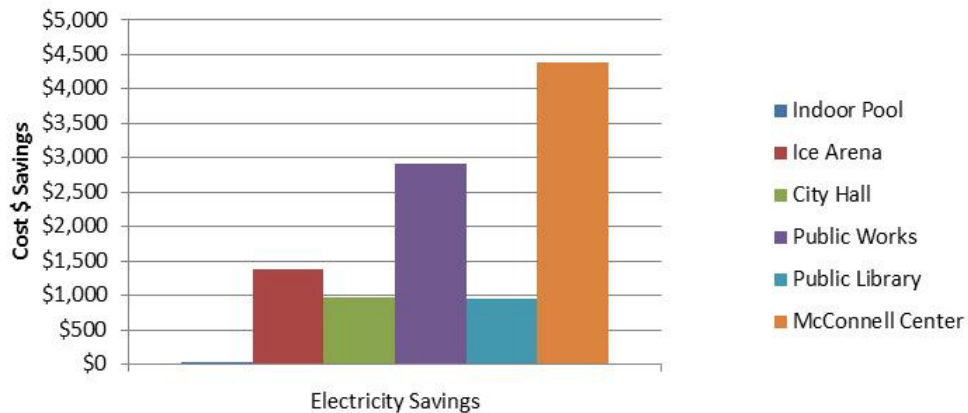
FIM 2: Lighting – Fixture Controls

By using occupancy sensors and shutting off lights in unoccupied areas, Dover is guaranteed to save 88,559 kWh per year, with a reduction in demand of 24.8 kW. As per the Detailed Energy Audit (DEA) page 28, FIM 2 annual cost savings are not taken using demand savings. Cost savings are calculated from consumption savings only and are guaranteed to be \$10,246.

| FIM 2: Lighting – Fixture Controls | | | | |
|--------------------------------------|---------------------|---------------|-----------------|-----------------------|
| Guarantee Year 1 Energy Cost Savings | | | | |
| Building | Electricity Savings | | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | |
| Indoor Pool | 1 | 261 | \$27 | \$27 |
| Ice Arena | 59 | 13,038 | \$1,382 | \$1,382 |
| City Hall | 61 | 7,747 | \$965 | \$965 |
| Public Works | 189 | 22,745 | \$2,910 | \$2,910 |
| Public Library | 0 | 7,103 | \$956 | \$956 |
| McConnell Center ⁽¹⁰⁾ | 0 | 40,795 | \$4,377 | \$4,377 |
| Totals | 310 | 91,690 | \$10,617 | \$10,617 |

⁽¹⁰⁾ McConnell Center included with FIM 2 from CO # 9236-0142-CO2

FIM 2: Year 1 Savings



Additional lighting occupancy sensors were added to the McConnell Center to offset the fixtures which were not installed as originally planned. Savings began to be realized starting June 25, 2012.

Several lighting sensors at the Public Works main building were measured using light sensitivity logging equipment over a one month period to verify the functionality of the sensors. Data obtained verifies the sensors are working correctly and is included in Appendix A for reference.

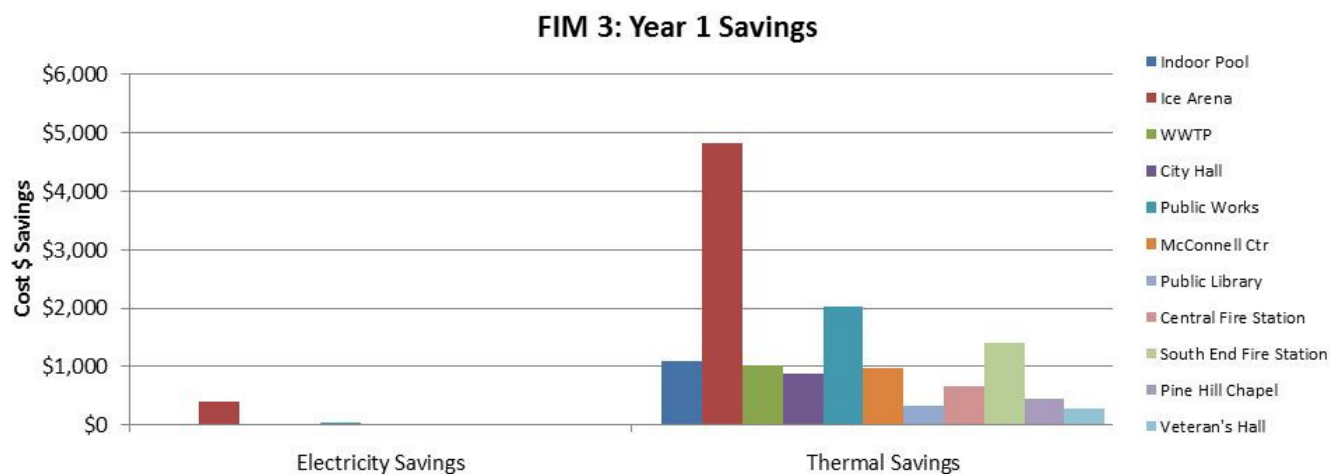
Verified savings are obtained from calculations which use collected data that tracked occupancy and lighting schedule in areas where equipment is installed. This data is used to verify lighting control savings. Calculation equations used have been provided in the appendix for reference. Fixture wattages under control of the sensors are stipulated as per the contract.

FIM DESCRIPTION

FIM 3: Building Envelope- Weatherization

Weatherization savings are determined by the losses of less conditioned air due to seals of gaps and openings in the building. The weatherization portion of the project is guaranteed to save 4,486 kWh of electrical energy and 1,019 MMBtu's in thermal energy, resulting in savings of \$14,461 per year.

| FIM 3: Building Envelope- Weatherization | | | | | | |
|--|---------------------|--------------|--------------|-----------------|-----------------|-----------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | |
| Building | Electricity Savings | | | Thermal Savings | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | MMBtu | Cost \$ | |
| Indoor Pool | 0 | 3 | \$0 | 75 | \$1,083 | \$1,083 |
| Ice Arena | 0 | 3,719 | \$394 | 382 | \$4,827 | \$5,221 |
| WWTP | 0 | 209 | \$22 | 61 | \$1,013 | \$1,034 |
| City Hall | 0 | 122 | \$15 | 53 | \$885 | \$900 |
| Public Works | 0 | 332 | \$42 | 179 | \$2,024 | \$2,067 |
| McConnell Center | 0 | 140 | \$15 | 68 | \$966 | \$981 |
| Public Library | 0 | 32 | \$4 | 24 | \$337 | \$341 |
| Central Fire Station | 0 | 176 | \$22 | 44 | \$671 | \$693 |
| South End Fire Station | 0 | 85 | \$11 | 79 | \$1,402 | \$1,413 |
| Pine Hill Chapel | 0 | 21 | \$4 | 27 | \$444 | \$448 |
| Veteran's Hall | 0 | 0 | \$0 | 16 | \$280 | \$280 |
| Totals | 0 | 4,838 | \$530 | 1,008 | \$13,932 | \$14,461 |



Thermal savings are slightly less than expected due to the warmer winter weather seen in 2011-12. Electric savings are slightly greater than expected due to the warmer weather over summer 2012.

Weatherization savings are derived directly from engineering spreadsheet calculations. General formulas used are located in Appendix C. The scope of work has been verified to be complete.

FIM DESCRIPTION

FIM 4: Energy Management System (EMS) - Upgrades

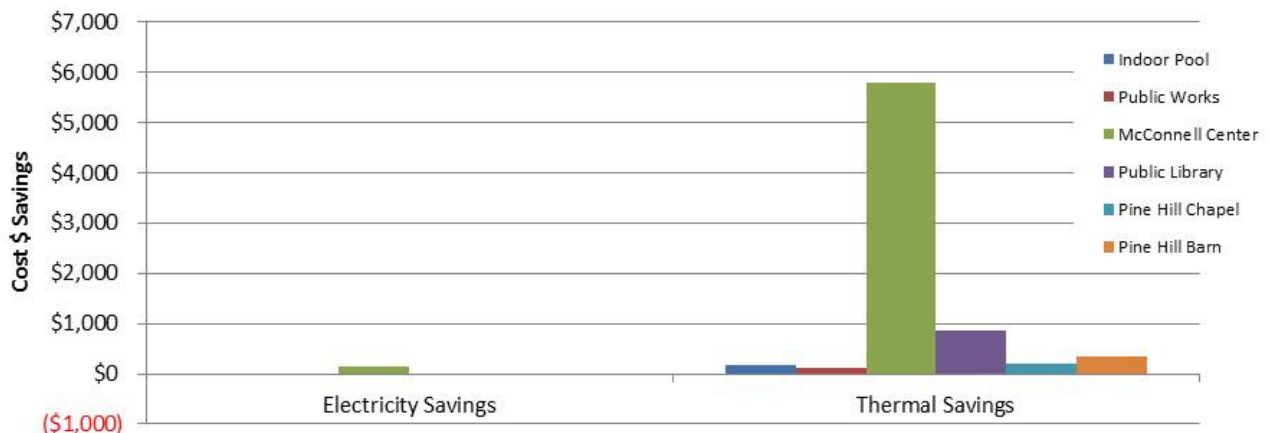
The EMS upgrade project is guaranteed to save 125,107 kWh of electrical energy and 1,138 MMBtu's of thermal energy totaling \$30,597. All sections of this FIM are further broken down as follows:

FIM 4.1: EMS- Building Controls

The building controls measure provides savings by providing a run-time schedule to provide a temperature setback when buildings are unoccupied, thus wasting less energy. The guaranteed annual energy savings for this FIM are calculated to be 1,092 kWh and 581 MMBtu's totaling \$8,398.

| FIM 4.1: Building Controls | | | | | | |
|--------------------------------------|---------------------|--------------|--------------|-----------------|----------------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | |
| Building | Electricity Savings | | | Thermal Savings | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | MMBtu | Cost \$ | |
| Indoor Pool | 0 | (7) | (\$1) | 12 | \$173 | \$172 |
| Public Works | 0 | 0 | \$0 | 9 | \$104 | \$138 |
| McConnell Center | 0 | 1,328 | \$142 | 410 | \$5,785 | \$5,928 |
| Public Library | 0 | 0 | \$0 | 60 | \$854 | \$1,133 |
| Pine Hill Chapel | 0 | 0 | \$0 | 11 | \$187 | \$249 |
| Pine Hill Barn | 0 | 0 | \$0 | 21 | \$354 | \$470 |
| Totals | 0 | 1,321 | \$142 | 524 | \$7,458 | \$7,599 |

FIM 4.1: Year 1 Savings



Verified savings are derived from calculations and verified by trending and totalization with FMS. General formulas have been provided in the appendix for reference. Hours of operation, pre-installation control strategies, and pre & post retrofit equipment energy consumption are stipulated.

FIM DESCRIPTION

FIM 4.2: EMS- Building Controls / Optimal Start

Savings for Building Controls / Optimal Start are based off of improved starting and running of air systems at the Dover City Hall. By optimizing control, there are guaranteed savings of 121 MMBtu resulting in \$2,023 annually.

| FIM 4.2: Building Controls / Optimal Start | | | |
|--|-----------------|---------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | |
| Building | Thermal Savings | | Total Cost \$ Savings |
| | MMBtu | Cost \$ | |
| City Hall | 103 | \$1,713 | \$1,713 |

Verified savings are from calculations and tracked with FMS. Formulas have been provided in Appendix C for reference. Hours of operation, pre-installation control strategies, and pre & post retrofit equipment energy consumption are stipulated.

FIM 4.3: Air Handling Unit Upgrade- VFD on Fan

The upgrade at the Dover Public Works building was installed for the AHU that serves the repair shop. With the VFD in place, the unit is able to slow down air flow based off occupancy. Thus savings are realized by using less energy on the AHU fan and having to condition less air. The completion of this measure was in August of 2011. This measure has been guaranteed to save \$6,615 (41,564 kWh & 115 MMBtu's) per year.

| FIM 4.3: Air Handling Unit Upgrade - VFD on Fan | | | | | | | | |
|---|---------------------|--------|---------|-----------------|---------|-----------------|---------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | |
| Building | Electricity Savings | | | Cooling Savings | | Heating Savings | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | kWh | Cost \$ | MMBtu | Cost \$ | |
| Public Works | 0 | 36,736 | \$4,700 | 3,957 | \$506 | 98 | \$1,111 | \$6,560 |

Verified savings are based off calculations and verified through measurement of fan kW, supply & space air temperatures. Calculations are spreadsheet based and general formulas have been provided in the appendix for reference. Hours of operation and motor power are stipulated.

This measure has been removed from the project (in September 2012) due to continued difficulty with parallel controls at the site. Any savings realized from this measure have been discontinued as of mid-September and will continue to produce no savings for the remainder of the project, unless the measure is re-visited in the future. There are no current plans to re-install this savings measure.

FIM DESCRIPTION

FIM 4.4: Pool Dehumidification- EMS & VFDs

The replacement of the AHU with a new PoolPac™ unit in the Dover Indoor Pool will create savings through the implementation of a temperature setback and slowed fan speeds during unoccupied hours. Additionally, this FIM will eliminate simultaneous heating and cooling in the pool office. These upgrades are guaranteed to save Dover 63,143 kWh and 320 MMBtu's resulting in an energy savings of \$11,203 annually. Additionally, as stipulated in the contract, a capital cost avoidance savings with this measure is valued at \$338,400 over the 10 year term or an annual cost avoidance of \$33,840.

| FIM 4.4: Pool Dehumidification - EMS & VFD's | | | | | | | |
|--|---------------------|--------|---------|-----------------|---------|--------------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | |
| Building | Electricity Savings | | | Thermal Savings | | Capital Cost | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | MMBtu | Cost \$ | Avoidance \$ | |
| Indoor Pool | 0 | 65,274 | \$6,821 | 331 | \$4,760 | \$33,840 | \$45,421 |

Verified savings are from engineering spreadsheet calculations and verified through tracking and trending of pool humidity levels using the BAS and loggers. Hours of operation, equipment energy consumption pre & post retrofit, and pool operational temperatures are stipulated.

JCI has conducted a Pool Dehumidification runtime and power study to verify performance of this measure. Data shows that the unit is currently setting back but JCI has found possible additional improvement to the system which can save Dover additional energy. Results and recommendations are published in Appendix A.

FIM 4.5: Repair Snow Melt Sensor

The snow melt sensor system at the Dover Transportation Center is generally run from mid-November through the end of March; during the winter snow season. By repairing the system and adding sensors to control use, Dover is guaranteed to save \$2,357 per winter.

| FIM 4.5: Repair Snow Melt Sensor | | | | |
|--------------------------------------|---------------------|--------|---------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | |
| Building | Electricity Savings | | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | |
| Dover Transportation Center | 0 | 20,051 | \$2,448 | \$2,448 |

Verified savings are derived from calculations involving power draw of the snow melt system and time-of-use of the system while operated manually. Savings are verified through inspection of post installation hours of operation. Calculations are from spreadsheets located in the DEA. Pre-installation hours of operation are a stipulated variable. A consideration is that savings are a function of the severity of the winter.

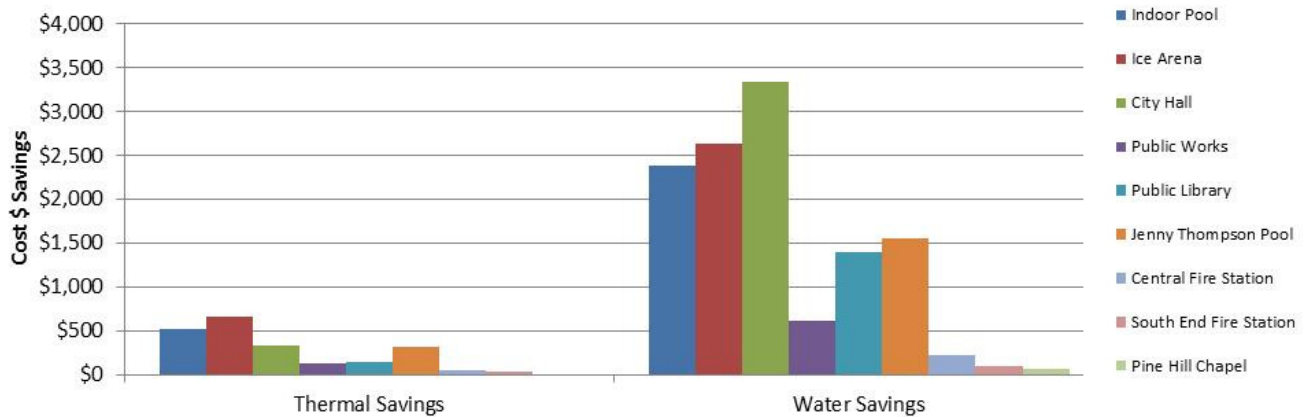
FIM DESCRIPTION

FIM 6: Water Conservation

The change in fixtures to more efficient ones is guaranteed to save 1,083 kgal of water annually and 159 MMBtu's in costs associated with heating that water. Total guaranteed savings are \$14,123.

| FIM 6: Water Conservation | | | | | |
|--------------------------------------|-----------------|----------------|---------------|-----------------|-----------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | |
| Building | Thermal Savings | | Water Savings | | Total Cost \$ Savings |
| | MMBtu | Cost \$ | kGal | Cost \$ | |
| Indoor Pool | 37 | \$529 | 216 | \$2,385 | \$2,915 |
| Ice Arena | 53 | \$668 | 239 | \$2,643 | \$3,311 |
| City Hall | 21 | \$345 | 303 | \$3,346 | \$3,691 |
| Public Works | 12 | \$141 | 56 | \$624 | \$764 |
| Public Library | 10 | \$148 | 128 | \$1,409 | \$1,558 |
| Jenny Thompson Pool | 25 | \$320 | 141 | \$1,559 | \$1,878 |
| Central Fire Station | 3 | \$51 | 21 | \$229 | \$281 |
| South End Fire Station | 2 | \$36 | 9 | \$99 | \$135 |
| Pine Hill Chapel | 0 | \$7 | 7 | \$72 | \$79 |
| Totals | 164 | \$2,245 | 1,120 | \$12,366 | \$14,611 |

FIM 6: Year 1 Savings



Verified savings are obtained from calculations and verified through flow measurements of fixtures before and after retrofit. Calculations have been provided in the appendix for reference. Pre-installation operation and occupancy are stipulated variables.

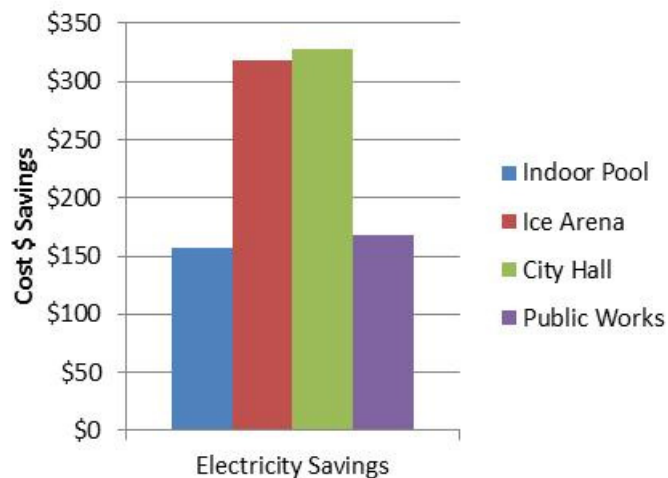
FIM DESCRIPTION

FIM 9: Vending Machine Controls

Savings from this FIM are derived from motion sensors which shut off the lights to the vending machine when nobody is around. The annual savings are guaranteed to be 8,146 kWh or \$936.

| FIM 9: Vending Machine Controls | | | | |
|--------------------------------------|---------------------|--------------|--------------|-----------------------|
| Guarantee Year 1 Energy Cost Savings | | | | |
| Building | Electricity Savings | | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | |
| Indoor Pool | 0 | 1,502 | \$157 | \$157 |
| Ice Arena | 0 | 3,004 | \$318 | \$318 |
| City Hall | 0 | 2,628 | \$327 | \$327 |
| Public Works | 0 | 1,314 | \$168 | \$168 |
| Totals | 0 | 8,448 | \$971 | \$971 |

FIM 9: Year 1 Savings



Verified savings for vending machine controls are directly from engineering calculations. Equations used have been provided in the appendix. The scope of work has been verified to be fully implemented.

FIM DESCRIPTION

FIM 10: Pool Covers

Covering the pool when it is not in use eliminates heating need and water losses during unoccupied times. The annual savings that Dover can expect to see by using the pool cover is 45,256 kWh, 543 MMBtu's & 62.4 kgals of water, resulting in a cost savings of \$13,223.

| FIM 10: Pool Covers | | | | | | | | |
|--------------------------------------|---------------------|--------|---------|-----------------|---------|---------------|---------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | |
| Building | Electricity Savings | | | Thermal Savings | | Water Savings | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | MMBtu | Cost \$ | kGal | Cost \$ | |
| Indoor Pool | 0 | 46,784 | \$4,889 | 561 | \$8,069 | 64 | \$712 | \$13,669 |

Verified savings for the pool covers are directly from engineering calculations. The installation has been inspected for completeness. Operational hours are a stipulated variable.

FIM DESCRIPTION

FIM 11: Ice Arena Updates

The Dover Ice Arena updates have been designed to produce an extra 32,649 kWh per year and create 61.8 kW more electrical demand per month (742 kW annually) in order to save 9,370 MMBtu's of natural gas annually. Resultant cost savings are guaranteed for \$95,015 per year. Additionally, from the work performed, there is an Operational Savings of \$10,800 for year 1 that is realized at the Ice Arena. This is a result of moving the dashers and a decreased cost in overall maintenance costs due to the new electric chiller.

| FIM 11: Ice Arena Upgrades | | | | | | | | |
|--------------------------------------|---------------------|----------|------------|-----------------|-----------|-----------|------------|------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | |
| Building | Electricity Savings | | | Thermal Savings | | Icemax | O&M | Total Cost |
| | kW | kWh | Cost \$ | MMBtu | Cost \$ | Cost \$ | \$ Savings | \$ Savings |
| Ice Arena | (674) | (92,132) | (\$14,130) | 9,673 | \$121,935 | (\$8,791) | \$10,800 | \$109,814 |

This FIM is measured using IPMVP option C which measures performance through the use of utility bill analysis. Monthly utility invoices have been analyzed and accounted for to determine FIM 11 savings. Calculations and supporting documentation can in the FIM 11 section of Appendix A.

FIM 11: Ice Arena Updates consists of the following measures which contribute to arena savings

- FIM 11.1: Low Emissivity Ceiling
- FIM 11.2: Ice Temperature Control Optimization
- FIM 11.3: Dehumidification Controls
- FIM 11.4: Icemax System
- FIM 11.5: Move the Dashers Inboard
- FIM 11.6: Installation of New Chiller
- FIM 11.7: Pumping System – VFD on Pump
- FIM 11.8: Controls Update

Since the implementation of these measures, savings realized over the summer at the Ice Arena are more significant than winter period. This is due to several of the measures providing more savings during warmer weather. For example, the low-e ceiling provides more of a difference in transfer of heat onto the ice surface over the summertime when weather is warmer and the sun's path is higher and longer.

FIM DESCRIPTION

FIM 12: Power Factor Correction

The power factor correction measure was designed to be applied at the Dover Ice Arena to correct and prevent low power factor. Other ancillary benefits to be gained by power factor correction include lower energy losses and better voltage regulation. It is guaranteed that by using the KVAR Energy Savings System the rink will save \$7,188 annually. There are currently no verified savings for this FIM since the system has not been completed. Expected completion took substantially longer than expected due to inability to have the chiller company provide documentation that the warranty on their equipment would not be affected by the implementation of the capacitors. As of the delivery date of this report, a letter has been received and work is in progress to complete this measure.

| FIM 12: Power Factor Correction | | | | |
|--------------------------------------|---------------------|-----|---------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | |
| Building | Electricity Savings | | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | |
| Ice Arena | 0 | 0 | \$0 | \$0 |

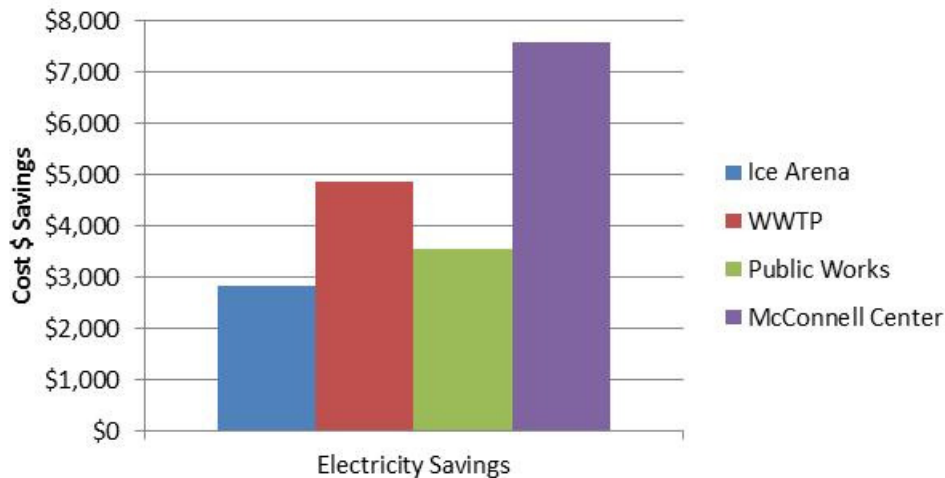
FIM DESCRIPTION

FIM 13: Energy Efficient Transformers

Savings associated with FIM 13 are from the replacement of transformers with more efficient ones, thus saving 145,554 kWh annually, with a monthly 25.7 kW reduction in demand (306 kW annually). Year 1 annual cost savings are guaranteed at \$18,385 per year.

| FIM 13: Transformers | | | | |
|--------------------------------------|---------------------|----------------|-----------------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | |
| Building | Electricity Savings | | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | |
| Ice Arena | 59 | 22,816 | \$2,835 | \$2,835 |
| WWTP | 114 | 39,363 | \$4,876 | \$4,876 |
| Public Works | 0 | 27,827 | \$3,560 | \$3,560 |
| McConnell Center | 146 | 61,035 | \$7,587 | \$7,587 |
| Totals | 318 | 151,041 | \$18,858 | \$18,858 |

FIM 13: Year 1 Savings



Verified savings for transformers are based off calculations and verified through field measurements of power, harmonics, and efficiency. Calculation equations have been provided in the appendix for reference. Operational hours and input power are stipulated variables.

FIM DESCRIPTION

FIM 14: Aeration Blowers – Retrofit

This measure is designed to save \$33,432 annually through the replacement of three older positive displacement blowers with new high efficiency turbine blowers. Guaranteed annual energy savings for this FIM are obtained by reducing the electricity consumption by 272,264 kWh and monthly demand by 62.2 kW. As of March 2012, the odor control unit and silencer which provides ability to run the unit 24-7 have been installed and scheduled to run full time to prevent odiferous concentration in the tanks. The energy usage of this blower has been subtracted from the overall blower savings. More information regarding this subject is provided in the Appendix.

| FIM 14: Aeration Blowers Retrofit | | | | |
|--------------------------------------|---------------------|---------|----------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | |
| Building | Electricity Savings | | | Total Cost \$ Savings |
| | kW | kWh | Cost \$ | |
| WWTP | 739 | 261,402 | \$32,158 | \$32,158 |

Additional controls work has been provided since full installation by both Dover and JCI to allow for further control of the units. This will assist the WWTP in control of the units and provide unrealized additional energy and operations savings based.

Verified savings are obtained from calculations and verified using measurements of power draw on the previous and new system. Methods of calculation have been provided in Appendix C for reference. Pre- installation loading and hours of operation are stipulated variables.

FIM 15: Boiler Replacement

Savings for this measure are based on an increase in boiler efficiency from the old boiler to the high efficiency gas-fired boiler by approximately 7%. It is assumed that the boiler runs roughly from the middle of September through the middle of April. The annual savings associated with FIM 15 are calculated to be 88 MMBtu's annually or \$1,251.

| FIM 15: Boiler Replacement | | | |
|--------------------------------------|-----------------|---------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | |
| Building | Thermal Savings | | Total Cost \$ Savings |
| | MMBtu | Cost \$ | |
| Public Library | 88 | \$1,251 | \$1,251 |

Verified savings are obtained from calculations and verified by testing the improved efficiency of the new boiler after emergency replacement of the old one. Calculations have been provided in the appendix for reference. Pre- installation boiler efficiency is a stipulated variable.

ENVIRONMENTAL BENEFITS

Year 1 Savings- Greenhouse Gas Emissions






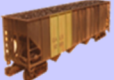
Total estimated emissions reductions from the project during the contract year are as follows:

| Estimated Emissions Reductions: Contract Year 1- Tons of CO ₂ -e | | | | | | |
|---|--|--------------|--------------|-------------|------------|--------------|
| FIM # | Facility Improvement Measure | Electricity | Natural Gas | #2 Fuel Oil | Propane | Total |
| FIM 1 | Lighting Fixtures | 99.8 | (9.5) | (1.0) | 0.0 | 89.3 |
| FIM 2 | Lighting Controls | 34.8 | 0.0 | 0.0 | 0.0 | 34.8 |
| FIM 3 | Weatherization | 1.8 | 41.8 | 10.3 | 5.0 | 59.1 |
| FIM 4 | EMS Upgrades | 49.0 | 48.9 | 9.9 | 0.0 | 107.9 |
| <i>FIM 4.1</i> | <i>Building Controls</i> | 0.5 | 26.1 | 2.4 | 0.0 | 29.0 |
| <i>FIM 4.2</i> | <i>Building Controls / Optimal Start</i> | 0.0 | 0.0 | 7.5 | 0.0 | 7.5 |
| <i>FIM 4.3</i> | <i>AHU Upgrade – VFD on Fan</i> | 16.2 | 5.2 | 0.0 | 0.0 | 21.4 |
| <i>FIM 4.4</i> | <i>Pool Dehumidification</i> | 24.8 | 17.6 | 0.0 | 0.0 | 42.4 |
| <i>FIM 4.5</i> | <i>Snow Melt Sensor</i> | 7.6 | 0.0 | 0.0 | 0.0 | 7.6 |
| FIM 6 | Water Conservation | 0.0 | 7.5 | 1.5 | 0.1 | 9.2 |
| FIM 9 | Vending Machine Controls | 3.2 | 0.0 | 0.0 | 0.0 | 3.2 |
| FIM 10 | Pool Cover | 17.8 | 29.8 | 0.0 | 0.0 | 47.6 |
| FIM 11 | Ice Rink Upgrades | (35.0) | 513.8 | 0.0 | 0.0 | 478.8 |
| FIM 12 | Power Factor Correction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| FIM 13 | Energy Efficient Transformers | 57.3 | 0.0 | 0.0 | 0.0 | 57.3 |
| FIM 14 | Aeration Blower Upgrade | 99.2 | 0.0 | 0.0 | 0.0 | 99.2 |
| FIM 15 | Boiler Replacement | 0.0 | 4.7 | 0.0 | 0.0 | 4.7 |
| Totals | | 327.9 | 637.1 | 20.8 | 5.2 | 991.0 |

ENVIRONMENTAL BENEFITS

Dover Contract Year 1 Equivalency Savings

The project's reduced emissions would be equivalent to:

| | | | |
|---|---------------|--|---|
| CO ₂ sequestered by | 25,410 | tree seedlings grown for 10 years in an urban scenario |  |
| CO ₂ sequestered by | 225 | acres of pine or fir forests |  |
| CO ₂ emissions from | 182 | passenger vehicles |  |
| CO ₂ emissions from | 2,305 | barrels of oil consumed |  |
| CO ₂ emissions from the <i>energy</i> use of | 87 | homes for one year |  |
| CO ₂ emissions from burning | 5 | coal railcars |  |

Version:

Energy Project GHG Calculator. USA Version 3.0. January 7, 2009.

APPENDIX A

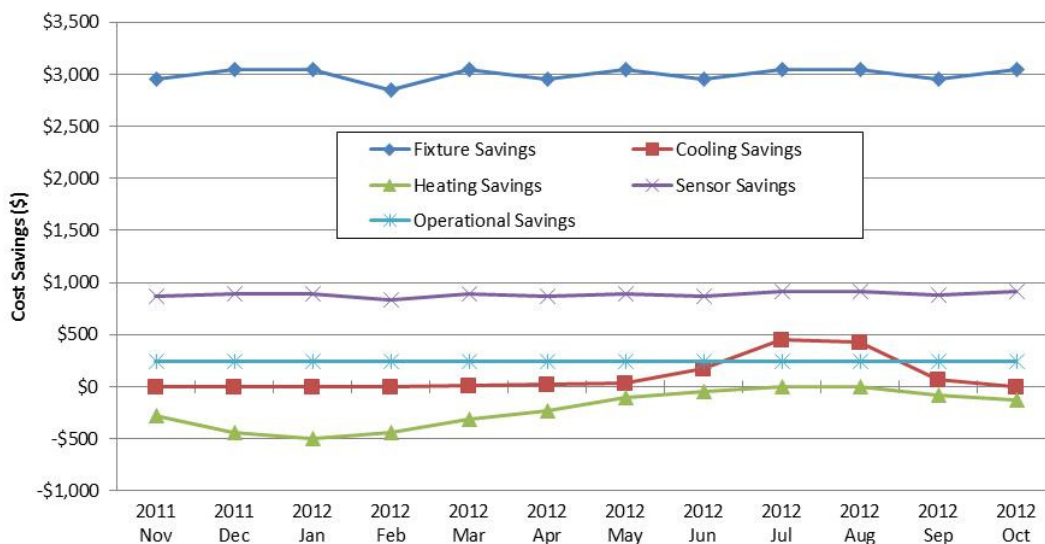
FIM 1 & 2: Lighting Fixture Retrofit & Controls

In the FIM 1 table below, energy savings are calculated using a combination of weather and days in order to provide a seasonal weighting towards cooling savings and heating losses. McConnell Center savings are included in this chart.

| FIM 1: Lighting – Fixture Retrofit | | | | | | | | | | |
|--------------------------------------|------|---------------------|----------------|-----------------|-----------------|----------------|-----------------|------------------|----------------|-----------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | | | |
| Month | Year | Electricity Savings | | | Cooling Savings | | Heating Savings | | O&M | Total Cost |
| | | kW | kWh | Cost \$ | kWh | Cost \$ | MMBtu | Cost \$ | \$ Savings | \$ Savings |
| November | 2011 | 119 | 20,668 | \$2,949 | 0 | \$0 | (21) | (\$279) | \$236 | \$2,907 |
| December | 2011 | 119 | 21,356 | \$3,047 | 0 | \$0 | (33) | (\$445) | \$244 | \$2,846 |
| January | 2012 | 119 | 21,356 | \$3,047 | 0 | \$0 | (37) | (\$495) | \$244 | \$2,796 |
| February | 2012 | 119 | 19,979 | \$2,851 | 0 | \$0 | (33) | (\$444) | \$228 | \$2,635 |
| March | 2012 | 119 | 21,356 | \$3,047 | 140 | \$16 | (23) | (\$311) | \$244 | \$2,996 |
| April | 2012 | 119 | 20,668 | \$2,949 | 206 | \$23 | (17) | (\$227) | \$236 | \$2,981 |
| May | 2012 | 119 | 21,356 | \$3,047 | 299 | \$33 | (8) | (\$101) | \$244 | \$3,223 |
| June | 2012 | 119 | 20,668 | \$2,949 | 1,570 | \$174 | (4) | (\$48) | \$236 | \$3,311 |
| July | 2012 | 119 | 21,356 | \$3,047 | 4,132 | \$457 | 0 | \$0 | \$244 | \$3,748 |
| August | 2012 | 119 | 21,356 | \$3,047 | 3,823 | \$423 | (0) | (\$1) | \$244 | \$3,713 |
| September | 2012 | 119 | 20,668 | \$2,949 | 617 | \$68 | (6) | (\$85) | \$236 | \$3,168 |
| October | 2012 | 119 | 21,356 | \$3,047 | 19 | \$2 | (9) | (\$127) | \$244 | \$3,167 |
| Contract Year 1 | | 1,426 | 252,144 | \$35,978 | 10,806 | \$1,195 | (192) | (\$2,562) | \$2,880 | \$37,490 |

FIM 1&2 savings are shown monthly below for the Contract Year:

FIM 1 & 2- Lighting Savings



APPENDIX A

FIM 1 & 2: Lighting Fixture Retrofit & Controls

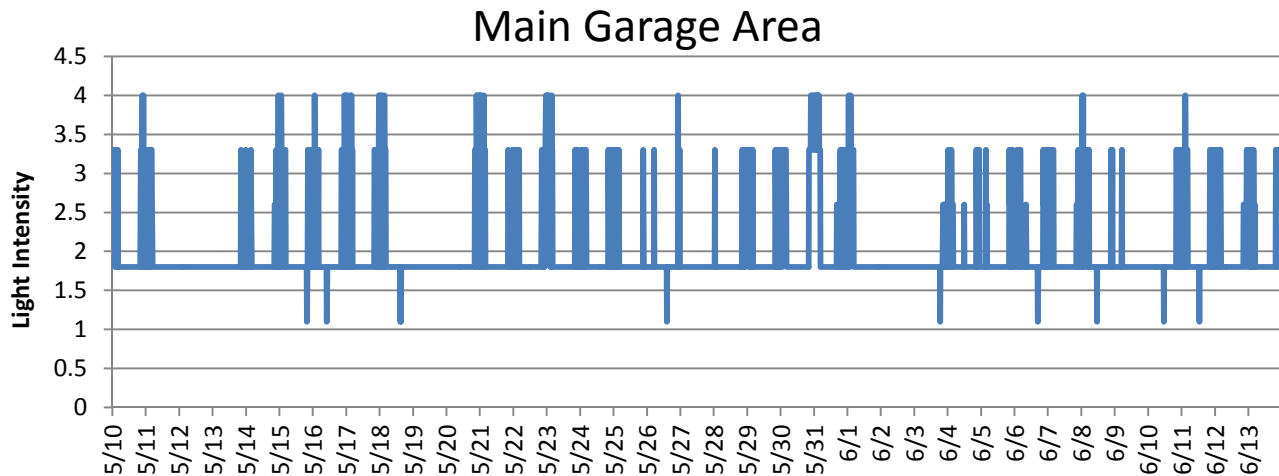
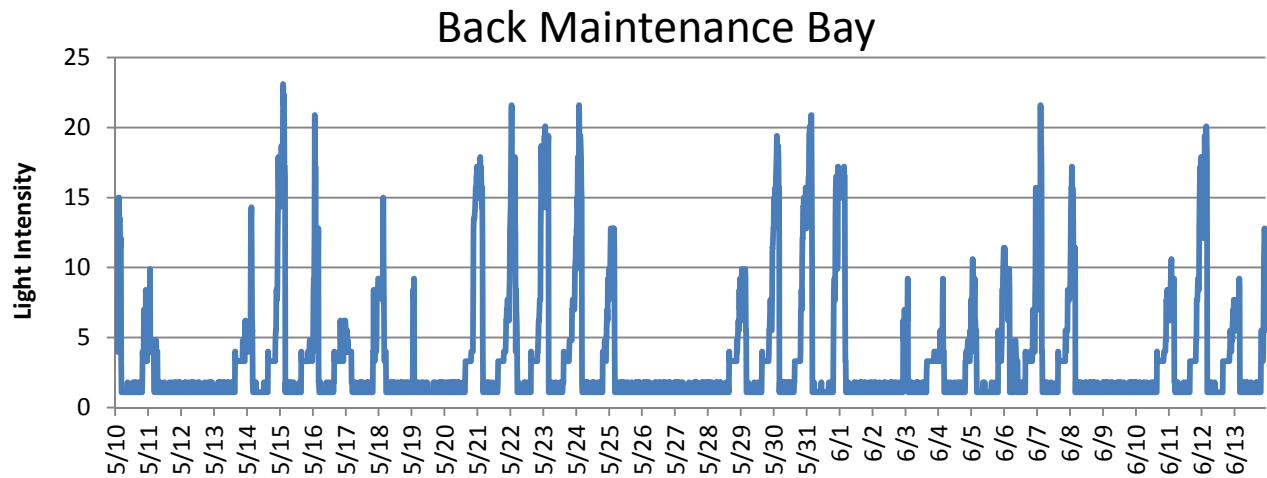
The FIM 2 table breaks down the measure by month over the contract year. McConnell Center savings are included in this chart.

| FIM 2: Lighting – Fixture Controls | | | | | |
|--------------------------------------|------|---------------------|---------------|-----------------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | |
| Month | Year | Electricity Savings | | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | |
| November | 2011 | 26 | 7,441 | \$862 | \$862 |
| December | 2011 | 26 | 7,689 | \$891 | \$891 |
| January | 2012 | 26 | 7,689 | \$891 | \$891 |
| February | 2012 | 26 | 7,193 | \$834 | \$834 |
| March | 2012 | 26 | 7,689 | \$891 | \$891 |
| April | 2012 | 26 | 7,441 | \$862 | \$862 |
| May | 2012 | 26 | 7,689 | \$891 | \$891 |
| June | 2012 | 26 | 7,477 | \$866 | \$866 |
| July | 2012 | 26 | 7,909 | \$915 | \$915 |
| August | 2012 | 26 | 7,909 | \$915 | \$915 |
| September | 2012 | 26 | 7,654 | \$885 | \$885 |
| October | 2012 | 26 | 7,909 | \$915 | \$915 |
| Contract Year 1 | | 310 | 91,690 | \$10,617 | \$10,617 |

APPENDIX A

FIM 1 & 2: Lighting Fixture Retrofit & Controls

A lighting sensor validation was conducted at the Public Works building by JCI. Loggers were placed in the two largest rooms against the south walls to prevent any direct sunlight from windows or openings. The results are shown in charts which present light intensity over time.



By looking at both charts, it is evident that on most weekend times, including the Memorial Day holiday, the lights are not on for extended periods since the building is not in constant use. Additionally, due to the varied nature of lighting output, there are lights constantly turning on and off as occupied which saves electricity.

According to this data taken from the Public Works building, the sensors are functioning properly and conserving electricity over the course of short and long unoccupied periods.

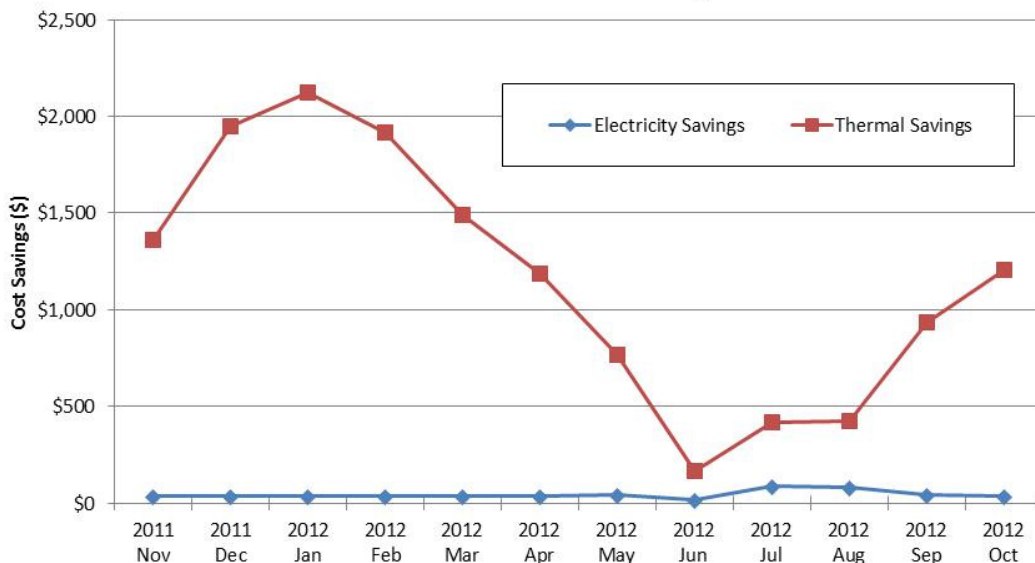
APPENDIX A

FIM 3: Weatherization

In the FIM 3 table below, energy savings are calculated using a combination of weather and days in order to provide a seasonal weighting towards cooling and heating savings. As such, cooling savings are more concentrated during warmer weather and heating savings are larger during colder weather when more heating is necessary.

| FIM 3: Weatherization | | | | | | | |
|--------------------------------------|------|---------------------|-------|---------|-----------------|----------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | |
| Month | Year | Electricity Savings | | | Thermal Savings | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | MMBtu | Cost \$ | |
| November | 2011 | 0 | 332 | \$35 | 98 | \$1,363 | \$1,398 |
| December | 2011 | 0 | 343 | \$36 | 138 | \$1,948 | \$1,985 |
| January | 2012 | 0 | 343 | \$36 | 150 | \$2,121 | \$2,157 |
| February | 2012 | 0 | 321 | \$34 | 136 | \$1,918 | \$1,952 |
| March | 2012 | 0 | 358 | \$38 | 107 | \$1,488 | \$1,526 |
| April | 2012 | 0 | 353 | \$38 | 86 | \$1,185 | \$1,223 |
| May | 2012 | 0 | 374 | \$40 | 57 | \$765 | \$805 |
| June | 2012 | 0 | 163 | \$20 | 11 | \$165 | \$185 |
| July | 2012 | 0 | 771 | \$88 | 33 | \$417 | \$505 |
| August | 2012 | 0 | 739 | \$84 | 33 | \$424 | \$508 |
| September | 2012 | 0 | 396 | \$43 | 70 | \$935 | \$978 |
| October | 2012 | 0 | 345 | \$37 | 89 | \$1,204 | \$1,241 |
| Contract Year 1 | | 0 | 4,838 | \$530 | 1,008 | \$13,932 | \$14,461 |

FIM 3- Weatherization Savings



APPENDIX A

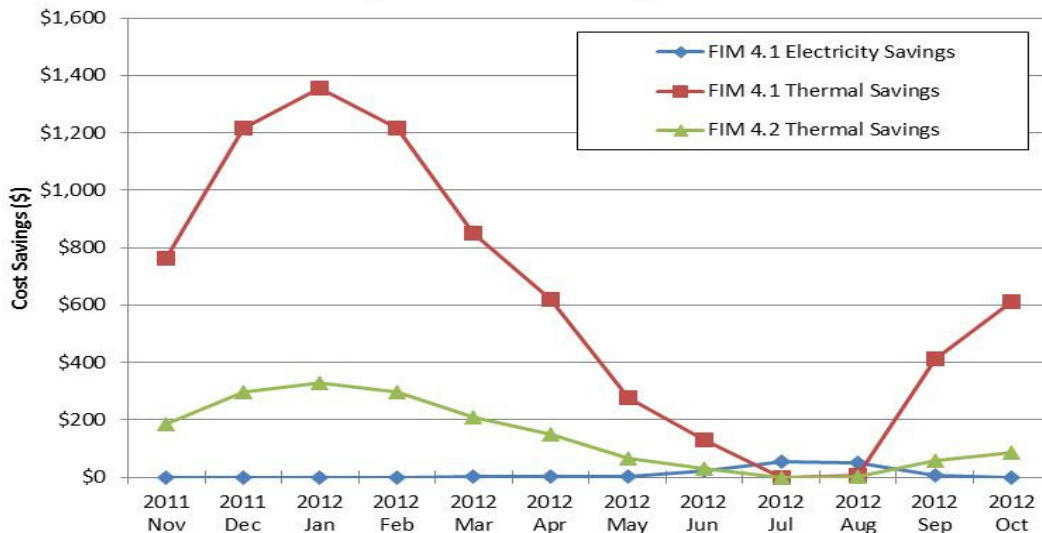
FIM 4: Energy Management System Upgrades

FIM 4.1: EMS – Building Controls & FIM 4.2: EMS – Building Controls / Optimal Start

In the FIM 4.1 & 4.2 table below, weather is used to provide a seasonal weighting towards cooling and heating savings. As such, cooling savings are more concentrated during warmer weather and heating savings are concentrated during colder weather when more heating is necessary.

| City of Dover | | FIM 4.1: EMS - Building Controls | | | | | | FIM 4.2: Building Controls / Optimal Start | | |
|------------------------|------|--------------------------------------|--------------|---------------------|------------|-----------------|----------------|--|-----------------|----------------|
| | | Guarantee Year 1 Energy Cost Savings | | | | | | Guarantee Year 1 Energy Cost Savings | | |
| | | Month | Year | Electricity Savings | | Thermal Savings | | Total Cost \$ Savings | Thermal Savings | |
| kW | kWh | | | Cost \$ | MMBtu | Cost \$ | MMBtu | | Cost \$ | |
| November | 2011 | 0 | 0 | \$0 | 54 | \$762 | \$762 | 11 | \$186 | \$186 |
| December | 2011 | 0 | 0 | \$0 | 85 | \$1,217 | \$1,217 | 18 | \$297 | \$297 |
| January | 2012 | 0 | 0 | \$0 | 95 | \$1,354 | \$1,354 | 20 | \$331 | \$331 |
| February | 2012 | 0 | 0 | \$0 | 85 | \$1,215 | \$1,215 | 18 | \$297 | \$297 |
| March | 2012 | 0 | 17 | \$2 | 60 | \$852 | \$853 | 12 | \$208 | \$208 |
| April | 2012 | 0 | 25 | \$3 | 44 | \$621 | \$624 | 9 | \$152 | \$152 |
| May | 2012 | 0 | 37 | \$4 | 19 | \$277 | \$281 | 4 | \$68 | \$68 |
| June | 2012 | 0 | 192 | \$21 | 9 | \$131 | \$152 | 2 | \$32 | \$32 |
| July | 2012 | 0 | 505 | \$54 | 0 | \$0 | \$54 | 0 | \$0 | \$0 |
| August | 2012 | 0 | 467 | \$50 | 0 | \$5 | \$56 | 0 | \$1 | \$1 |
| September | 2012 | 0 | 75 | \$8 | 29 | \$412 | \$420 | 3 | \$57 | \$57 |
| October | 2012 | 0 | 2 | \$0 | 43 | \$610 | \$611 | 5 | \$85 | \$85 |
| Contract Year 1 | | 0 | 1,321 | \$142 | 524 | \$7,458 | \$7,599 | 103 | \$1,713 | \$1,713 |

FIM 4.1/4.2- EMS Building Controls



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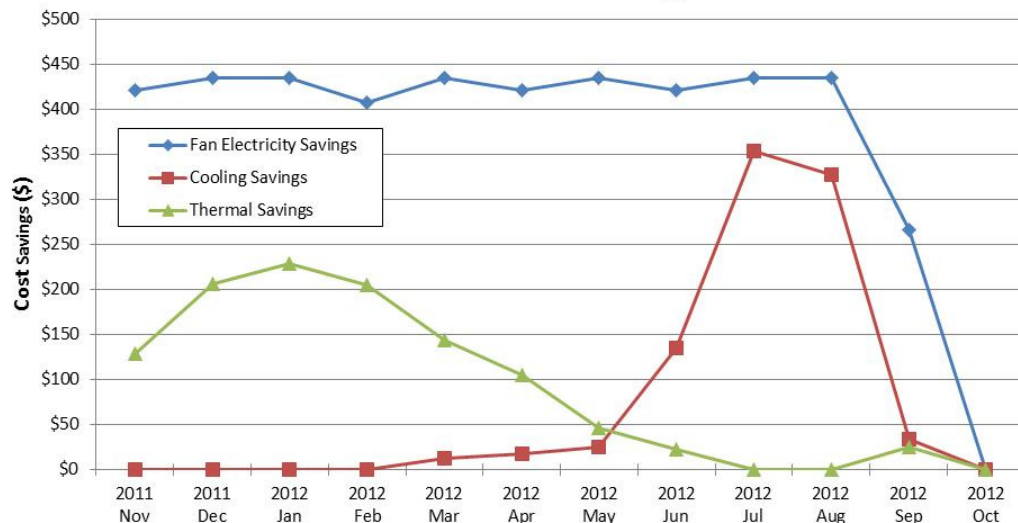
FIM 4: Energy Management System Upgrades

FIM 4.3: AHU Upgrade – VFD on Fan

Savings for fan electricity are based off fan run-time while conditioning savings are weighted based off monthly weather and temperature profiles. This VFD installed as part of this unit was removed on 9/19/2012 due to difficulty of operation and multiple ongoing problems. There is no current plan to re-install the VFD on this unit

| FIM 4.3: AHU Upgrade - VFD on Fan | | | | | | | | | |
|--------------------------------------|------|-------------------------|---------------|----------------|-----------------|--------------|-----------------|----------------|-----------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | | |
| Month | Year | Fan Electricity Savings | | | Cooling Savings | | Thermal Savings | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | kWh | Cost \$ | MMBtu | Cost \$ | |
| November | 2011 | 0 | 3,290 | \$421 | 0 | \$0 | 11 | \$129 | \$550 |
| December | 2011 | 0 | 3,399 | \$435 | 0 | \$0 | 18 | \$205 | \$640 |
| January | 2012 | 0 | 3,399 | \$435 | 0 | \$0 | 20 | \$229 | \$663 |
| February | 2012 | 0 | 3,180 | \$407 | 0 | \$0 | 18 | \$205 | \$612 |
| March | 2012 | 0 | 3,399 | \$435 | 94 | \$12 | 13 | \$144 | \$591 |
| April | 2012 | 0 | 3,290 | \$421 | 138 | \$18 | 9 | \$105 | \$543 |
| May | 2012 | 0 | 3,399 | \$435 | 200 | \$26 | 4 | \$47 | \$507 |
| June | 2012 | 0 | 3,290 | \$421 | 1,050 | \$134 | 2 | \$22 | \$577 |
| July | 2012 | 0 | 3,399 | \$435 | 2,763 | \$353 | 0 | \$0 | \$788 |
| August | 2012 | 0 | 3,399 | \$435 | 2,557 | \$327 | 0 | \$1 | \$763 |
| September | 2012 | 0 | 2,084 | \$267 | 261 | \$33 | 2 | \$25 | \$325 |
| October | 2012 | 0 | 0 | \$0 | 0 | \$0 | 0 | \$0 | \$0 |
| Contract Year 1 | | 0 | 35,529 | \$4,546 | 7,062 | \$904 | 98 | \$1,111 | \$6,560 |

FIM 4.3- VFD on AHU Savings



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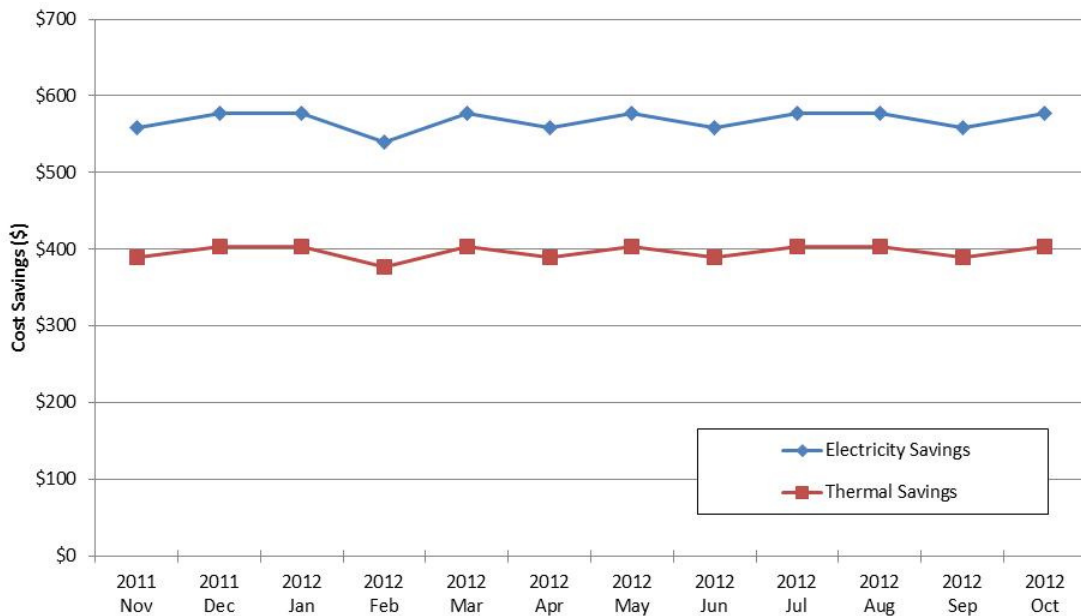
FIM 4: Energy Management System Upgrades

FIM 4.4: Pool Dehumidification – EMS & VFD's

In the FIM 4.4 table below, electricity and thermal savings are realized by the Indoor Pool as follows:

| FIM 4.4: Pool Dehumidification - EMS & VFD's | | | | | | | | |
|--|------|---------------------|--------|---------|-----------------|---------|--------------|------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | |
| Month | Year | Electricity Savings | | | Thermal Savings | | Capital Cost | Total Cost |
| | | kW | kWh | Cost \$ | MMBtu | Cost \$ | \$ Avoidance | |
| November | 2011 | 0 | 5,350 | \$559 | 27 | \$390 | \$2,774 | \$3,723 |
| December | 2011 | 0 | 5,529 | \$578 | 28 | \$403 | \$2,866 | \$3,847 |
| January | 2012 | 0 | 5,529 | \$578 | 28 | \$403 | \$2,866 | \$3,847 |
| February | 2012 | 0 | 5,172 | \$540 | 26 | \$377 | \$2,681 | \$3,599 |
| March | 2012 | 0 | 5,529 | \$578 | 28 | \$403 | \$2,866 | \$3,847 |
| April | 2012 | 0 | 5,350 | \$559 | 27 | \$390 | \$2,774 | \$3,723 |
| May | 2012 | 0 | 5,529 | \$578 | 28 | \$403 | \$2,866 | \$3,847 |
| June | 2012 | 0 | 5,350 | \$559 | 27 | \$390 | \$2,774 | \$3,723 |
| July | 2012 | 0 | 5,529 | \$578 | 28 | \$403 | \$2,866 | \$3,847 |
| August | 2012 | 0 | 5,529 | \$578 | 28 | \$403 | \$2,866 | \$3,847 |
| September | 2012 | 0 | 5,350 | \$559 | 27 | \$390 | \$2,774 | \$3,723 |
| October | 2012 | 0 | 5,529 | \$578 | 28 | \$403 | \$2,866 | \$3,847 |
| Contract Year 1 | | 0 | 65,274 | \$6,821 | 331 | \$4,760 | \$33,840 | \$45,421 |

FIM 4.4- Pool Dehumidification Savings

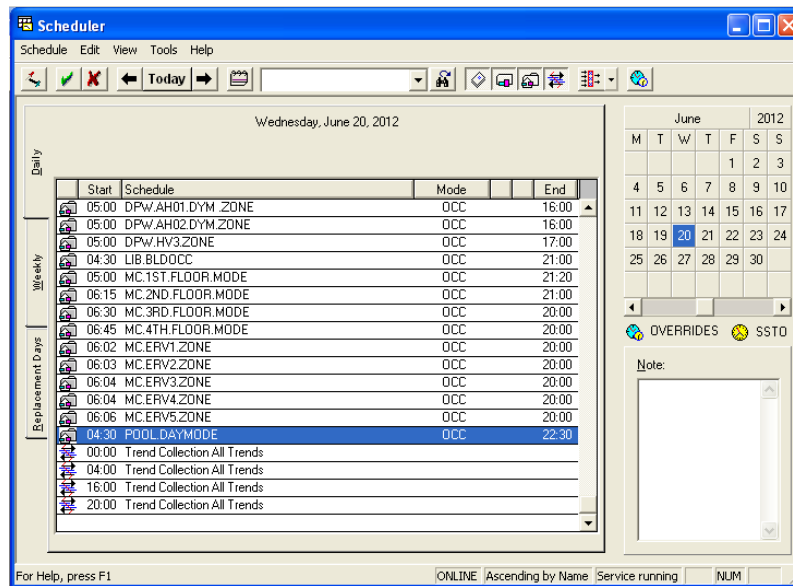
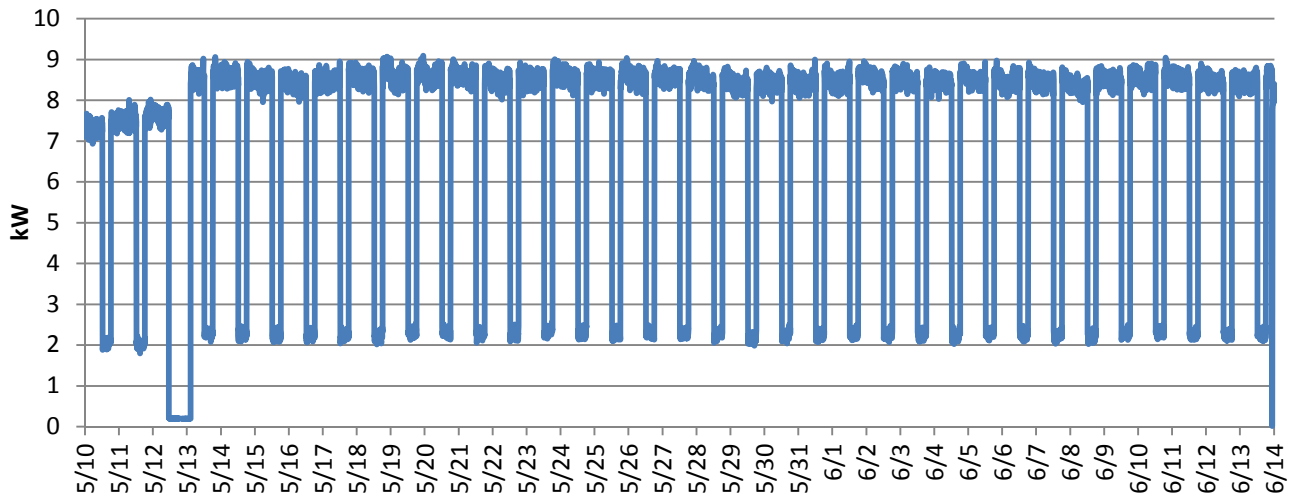


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FIM 4: Energy Management System Upgrades

The pool dehumidification unit was examined by JCI. Runtime loggers were placed in the unit to track power draw of the unit over a one month period. The results are shown below:

Pool Dehumidification Unit- Total kW Draw



For all seven days a week, the unit is currently set to daytime mode from 4:30AM until 10:30PM which is seen on the BAS system and in the logger data. The current operating hours of the pool are less than the 126 hours per week the unit is set to occupied mode. JCI sees a slight opportunity for further improvement of unit scheduling which will decrease energy usage at the Indoor Pool.

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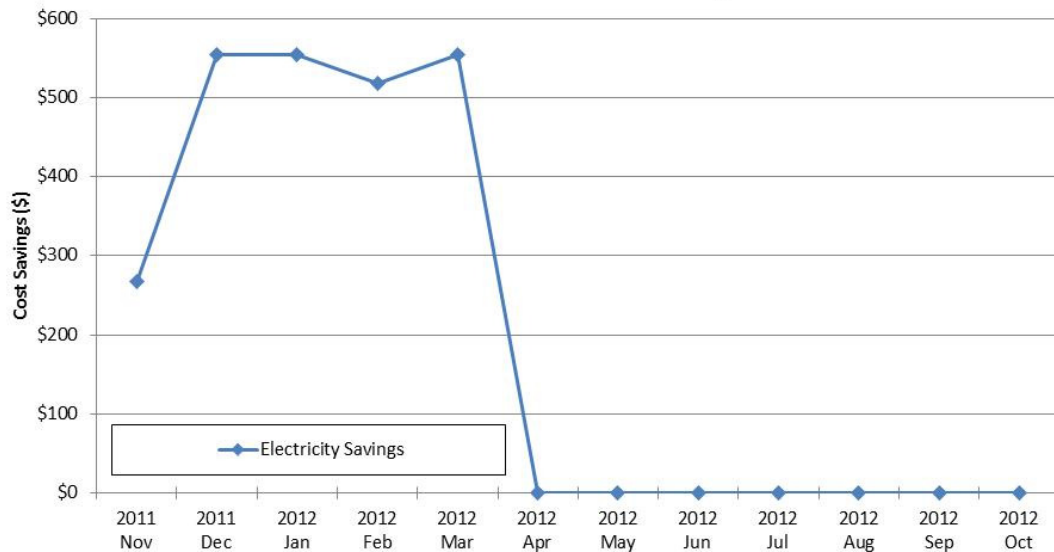
FIM 4: Energy Management System Upgrades

FIM 4.5: Repair Snow Melt Sensor

The snow melt sensor is assumed to be operational from mid November through March during the snow season. Savings are concentrated over that period.

| FIM 4.5: Repair Snow Melt Sensor | | | | | |
|--------------------------------------|------|---------------------|---------------|----------------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | |
| Month | Year | Electricity Savings | | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | |
| November | 2011 | 0 | 2,195 | \$268 | \$268 |
| December | 2011 | 0 | 4,537 | \$554 | \$554 |
| January | 2012 | 0 | 4,537 | \$554 | \$554 |
| February | 2012 | 0 | 4,244 | \$518 | \$518 |
| March | 2012 | 0 | 4,537 | \$554 | \$554 |
| April | 2012 | 0 | 0 | \$0 | \$0 |
| May | 2012 | 0 | 0 | \$0 | \$0 |
| June | 2012 | 0 | 0 | \$0 | \$0 |
| July | 2012 | 0 | 0 | \$0 | \$0 |
| August | 2012 | 0 | 0 | \$0 | \$0 |
| September | 2012 | 0 | 0 | \$0 | \$0 |
| October | 2012 | 0 | 0 | \$0 | \$0 |
| Contract Year 1 | | 0 | 20,051 | \$2,448 | \$2,448 |

FIM 4.5- Snow Melt Sensor Savings



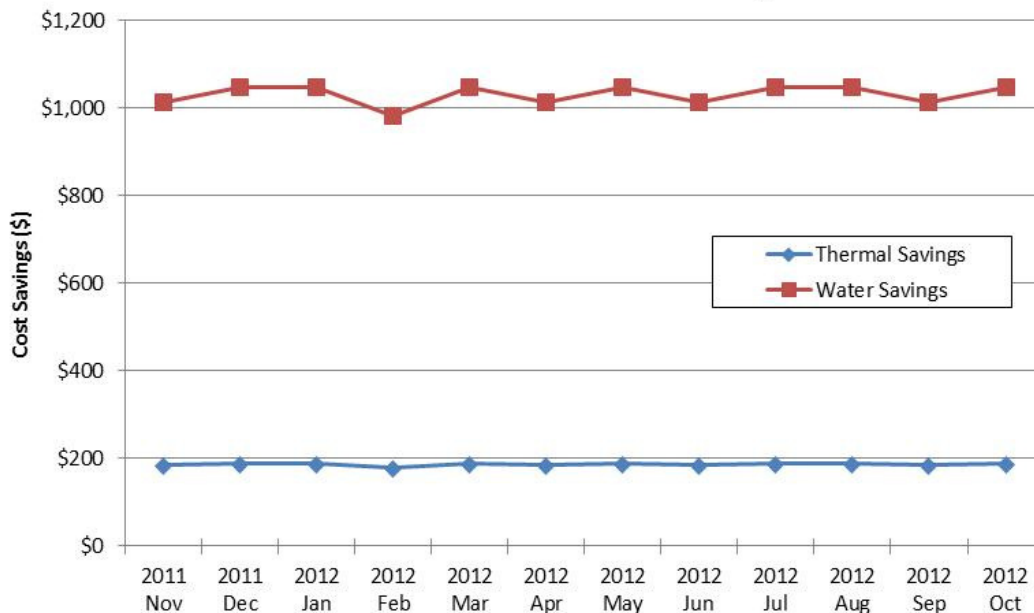
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FIM 6: Water Conservation

The FIM 6 table and chart breaks down the monthly savings by month over Year 1:

| FIM 6: Water Conservation | | | | | | |
|--------------------------------------|------|-----------------|----------------|---------------|-----------------|-----------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | |
| Month | Year | Thermal Savings | | Water Savings | | Total Cost \$ Savings |
| | | MMBtu | Cost \$ | kGal | Cost \$ | |
| November | 2011 | 13 | \$184 | 92 | \$1,014 | \$1,198 |
| December | 2011 | 14 | \$190 | 95 | \$1,047 | \$1,238 |
| January | 2012 | 14 | \$190 | 95 | \$1,047 | \$1,238 |
| February | 2012 | 13 | \$178 | 89 | \$980 | \$1,158 |
| March | 2012 | 14 | \$190 | 95 | \$1,047 | \$1,238 |
| April | 2012 | 13 | \$184 | 92 | \$1,014 | \$1,198 |
| May | 2012 | 14 | \$190 | 95 | \$1,047 | \$1,238 |
| June | 2012 | 13 | \$184 | 92 | \$1,014 | \$1,198 |
| July | 2012 | 14 | \$190 | 95 | \$1,047 | \$1,238 |
| August | 2012 | 14 | \$190 | 95 | \$1,047 | \$1,238 |
| September | 2012 | 13 | \$184 | 92 | \$1,014 | \$1,198 |
| October | 2012 | 14 | \$190 | 95 | \$1,047 | \$1,238 |
| Contract Year 1 | | 164 | \$2,245 | 1,120 | \$12,366 | \$14,611 |

FIM 6- Water Conservation Savings



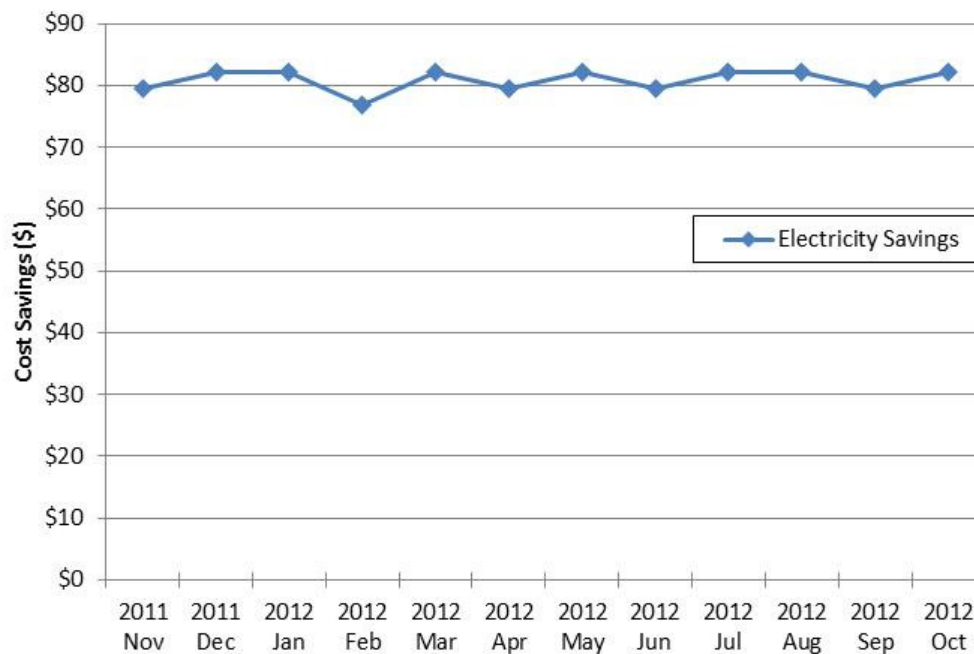
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FIM 9: Vending Machine Controls

The FIM 9 table breaks down the measure by month over the contract year.

| FIM 9: Vending Machine Controls | | | | | |
|--------------------------------------|------|---------------------|--------------|--------------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | |
| Month | Year | Electricity Savings | | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | |
| November | 2011 | 0 | 692 | \$80 | \$80 |
| December | 2011 | 0 | 716 | \$82 | \$82 |
| January | 2012 | 0 | 716 | \$82 | \$82 |
| February | 2012 | 0 | 669 | \$77 | \$77 |
| March | 2012 | 0 | 716 | \$82 | \$82 |
| April | 2012 | 0 | 692 | \$80 | \$80 |
| May | 2012 | 0 | 716 | \$82 | \$82 |
| June | 2012 | 0 | 692 | \$80 | \$80 |
| July | 2012 | 0 | 716 | \$82 | \$82 |
| August | 2012 | 0 | 716 | \$82 | \$82 |
| September | 2012 | 0 | 692 | \$80 | \$80 |
| October | 2012 | 0 | 716 | \$82 | \$82 |
| Contract Year 1 | | 0 | 8,448 | \$971 | \$971 |

FIM 9- Vending Controls Savings



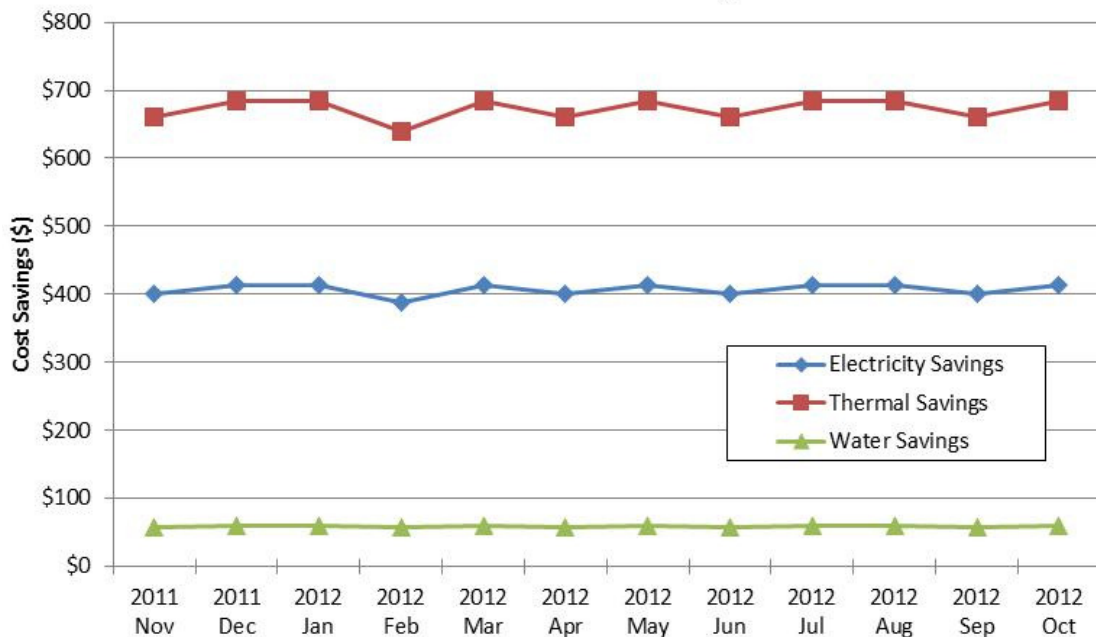
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FIM 10: Pool Cover

The following FIM 10 table and chart break down the measure by month over the contract year.

| FIM 10: Pool Cover | | | | | | | | | |
|--------------------------------------|------|---------------------|--------|---------|-----------------|---------|---------------|---------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | | |
| Month | Year | Electricity Savings | | | Thermal Savings | | Water Savings | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | MMBtu | Cost \$ | kGal | Cost \$ | |
| November | 2011 | 0 | 3,835 | \$401 | 46 | \$661 | 5.3 | \$58 | \$1,120 |
| December | 2011 | 0 | 3,963 | \$414 | 48 | \$683 | 5.5 | \$60 | \$1,158 |
| January | 2012 | 0 | 3,963 | \$414 | 48 | \$683 | 5.5 | \$60 | \$1,158 |
| February | 2012 | 0 | 3,707 | \$387 | 44 | \$639 | 5.1 | \$56 | \$1,083 |
| March | 2012 | 0 | 3,963 | \$414 | 48 | \$683 | 5.5 | \$60 | \$1,158 |
| April | 2012 | 0 | 3,835 | \$401 | 46 | \$661 | 5.3 | \$58 | \$1,120 |
| May | 2012 | 0 | 3,963 | \$414 | 48 | \$683 | 5.5 | \$60 | \$1,158 |
| June | 2012 | 0 | 3,835 | \$401 | 46 | \$661 | 5.3 | \$58 | \$1,120 |
| July | 2012 | 0 | 3,963 | \$414 | 48 | \$683 | 5.5 | \$60 | \$1,158 |
| August | 2012 | 0 | 3,963 | \$414 | 48 | \$683 | 5.5 | \$60 | \$1,158 |
| September | 2012 | 0 | 3,835 | \$401 | 46 | \$661 | 5.3 | \$58 | \$1,120 |
| October | 2012 | 0 | 3,963 | \$414 | 48 | \$683 | 5.5 | \$60 | \$1,158 |
| Contract Year 1 | | 0 | 46,784 | \$4,889 | 561 | \$8,069 | 64 | \$712 | \$13,669 |

FIM 10- Pool Cover Savings



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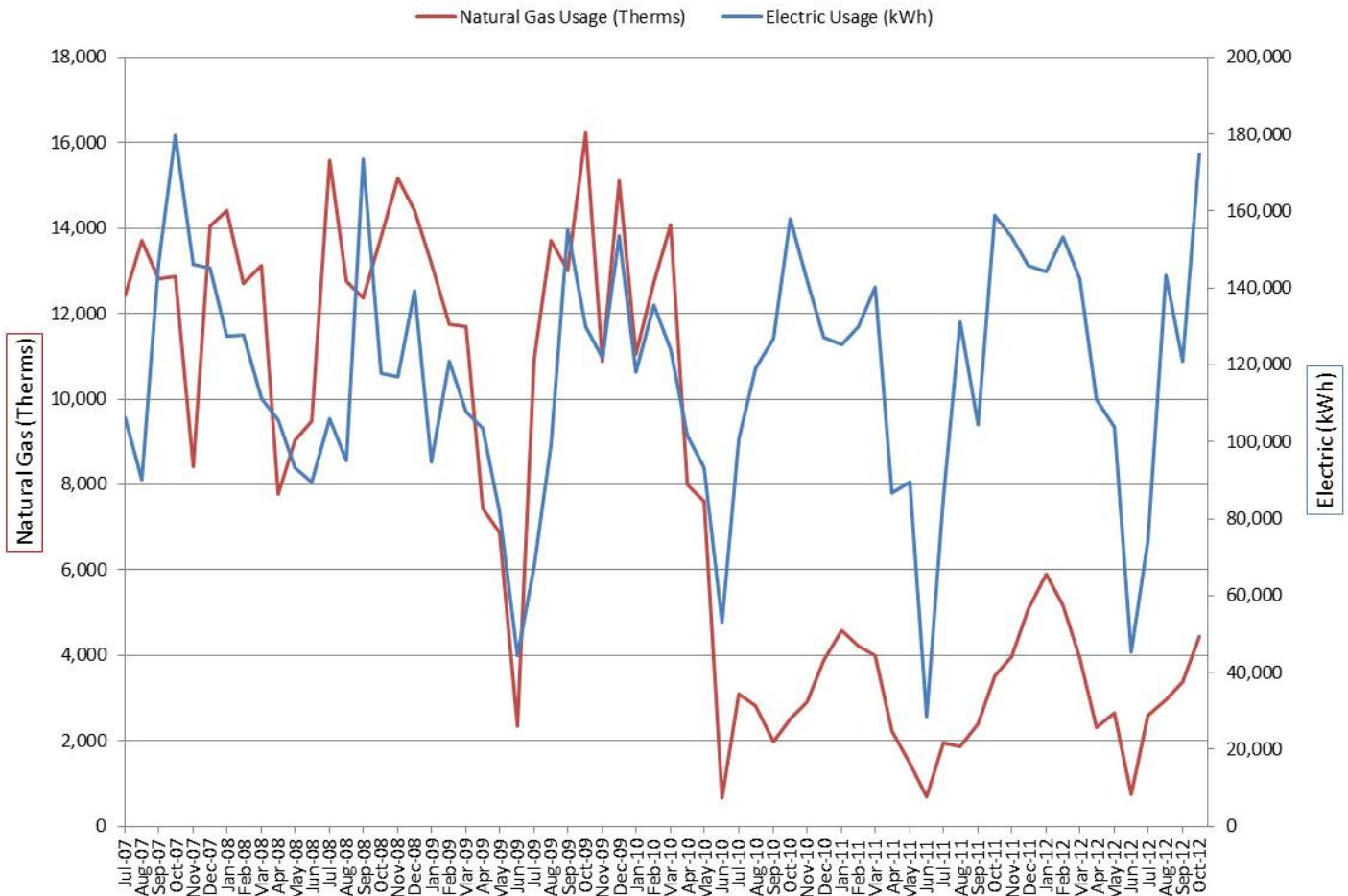
FIM 11: Ice Arena Upgrades

Overall Utility Comparison

The Ice Arena part of this project consists of many items that together will achieve savings. The measurement method of FIM 11 is done via entire building utility comparison analysis. This analysis compares the usage of electricity and natural gas before and after the changes occurred. It applies the change in utilities use to track the effectiveness and calculate the savings of the work done.

The natural gas and electric usage are affected by the measures implemented at the Ice Arena. There is a complex relationship between the two usages. Below is a graph showing the history of both since July 2007. As a note, most FIM 11 work was completed between June and September 2010.

Dover Ice Arena- Monthly Electric & Gas Usage



APPENDIX A

FIM 11: Ice Arena Upgrades

As part of the utility bill comparison, normalization of utility data is done through the use of Metrix software. This takes weather history and other entered variables into account in order to provide bills in different years and scenarios on an equal playing field. Weather degree days have been provided in Appendix B.

The one entered variable needed in this case is shown below. In order to properly take into account the load seen by the chillers and rink scheduling, this 'Chiller- Ice Hours' variable was created and used in the regression analysis performed. Below is the simple calculation table and equations used to create the variable.

| Dover Ice Arena Chiller- Ice Hours Variable Calculation | | | | | | |
|---|-------------|---------|---------|-----------|------------------|--------------------|
| Month | Avail Hours | Arena 1 | Arena 2 | Ice Hours | 2nd Rink Startup | Chiller- Ice Hours |
| August | 744 | 100% | 0% | 744 | 0 | 744 |
| September | 720 | 100% | 23% | 888 | 540 | 1,428 |
| October | 744 | 100% | 100% | 1,488 | 186 | 1,674 |
| November | 720 | 100% | 100% | 1,440 | 0 | 1,440 |
| December | 744 | 100% | 100% | 1,488 | 0 | 1,488 |
| January | 744 | 100% | 100% | 1,488 | 0 | 1,488 |
| February | 696 | 100% | 100% | 1,392 | 0 | 1,392 |
| March | 744 | 100% | 100% | 1,488 | 0 | 1,488 |
| April | 720 | 100% | 0% | 720 | 0 | 720 |
| May | 744 | 100% | 0% | 744 | 0 | 744 |
| June | 720 | 0% | 0% | 0 | 0 | 0 |
| July | 744 | 100% | 0% | 744 | 0 | 744 |

$$\text{Ice Hours} = \text{Available Hours} \times (\text{Arena 1} + \text{Arena 2})$$

$$\text{Chiller-Ice Hours} = \text{Ice Hours} + \text{2nd Rink Startup}$$

$$\text{2nd Rink Startup}_{\text{Sept.}} = \frac{168 \frac{\text{Hours}}{\text{Week}} \times 30 \frac{\text{Days}}{\text{Month}} \times \frac{3}{4} \text{ Months Run Time}}{7 \frac{\text{Days}}{\text{Week}}}$$

$$\text{2nd Rink Startup}_{\text{Oct.}} = \frac{168 \frac{\text{Hours}}{\text{Week}} \times 31 \frac{\text{Days}}{\text{Month}} \times \frac{1}{4} \text{ Months Run Time}}{7 \frac{\text{Days}}{\text{Week}}}$$

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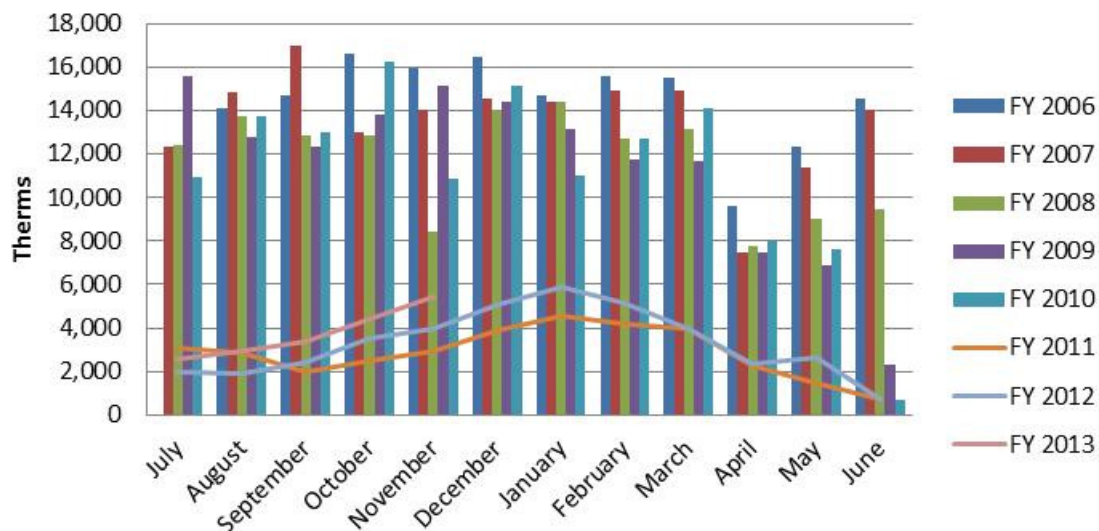
FIM 11: Ice Arena Upgrades- Natural Gas

Natural Gas

Savings from FIM 11 are realized through comparison of utility bills. Below is the natural gas usage per month obtained from bills over the baseline year through the current date. Baseline data in the chart below is in green and year 1 contract data is in yellow.

| Dover Ice Arena Natural Gas Billable Usage (Therms) | | | | | | |
|---|-----------|-----------|-----------|-----------|-----------|-----------|
| Month | 2007 - 08 | 2008 - 09 | 2009 - 10 | 2010 - 11 | 2011 - 12 | 2012 - 13 |
| August | 13,703 | 12,769 | 13,718 | 2,828 | 1,869 | 3,384 |
| September | 12,817 | 12,369 | 13,008 | 1,995 | 2,403 | 4,433 |
| October | 12,869 | 13,804 | 16,225 | 2,527 | 3,522 | 5,443 |
| November | 8,430 | 15,155 | 10,880 | 2,917 | 3,956 | - |
| December | 14,039 | 14,410 | 15,114 | 3,875 | 5,092 | - |
| January | 14,419 | 13,171 | 11,041 | 4,593 | 5,911 | - |
| February | 12,708 | 11,754 | 12,717 | 4,225 | 5,183 | - |
| March | 13,110 | 11,687 | 14,072 | 4,003 | 3,955 | - |
| April | 7,784 | 7,441 | 8,006 | 2,246 | 2,323 | - |
| May | 9,038 | 6,892 | 7,616 | 1,470 | 2,665 | - |
| June | 9,495 | 2,336 | 675 | 688 | 742 | - |
| July | 15,589 | 10,925 | 3,110 | 1,943 | 2,599 | - |

Dover Ice Arena- Monthly Natural Gas Usage



APPENDIX A

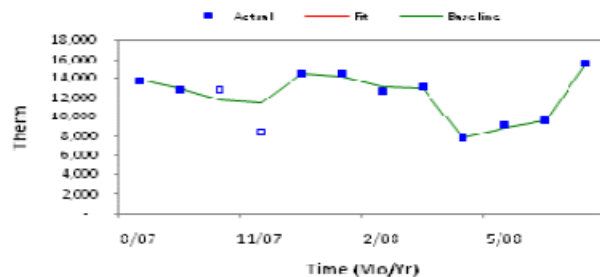
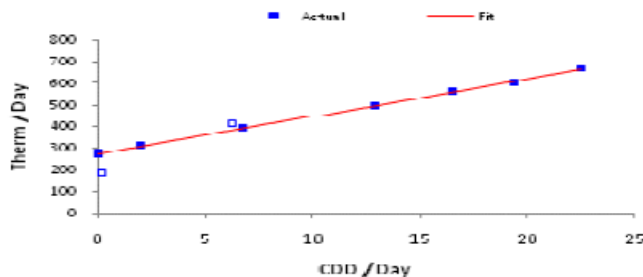
FIM 11: Ice Arena Upgrades- Natural Gas

Using Metrix regression analysis software, a natural gas usage baseline was developed for the Ice Arena to be used in comparing bills with different weather and arena usage. The meter tuning contract for natural gas is included below. This provides the calculation of how the FIM 11 baseline for natural gas was developed.

Meter Tuning Contract

Project: Dover, NH
Area: Dover Ice Arena
Account: 4170121-4061358

Site: Dover, NH
Meter: Natural Gas
Unit: Therm(Qty OnPk)



| From | To | # Days | Reading | Incl? | HDD | CDD | Chiller-Ice Hours | Offset | Baseline | Deviation |
|------------------------|----------|------------|----------------|-------------------------------------|---------------|---------------|-------------------|----------|----------------|--------------------|
| 08/01/07 | 08/31/07 | 31 | 13,703 | <input checked="" type="checkbox"/> | 29.5 | 601.0 | 744 | - | 13,869 | 1.2% |
| 09/01/07 | 09/30/07 | 30 | 12,817 | <input checked="" type="checkbox"/> | 109.0 | 386.0 | 1,428 | - | 12,980 | 1.3% |
| 10/01/07 | 10/31/07 | 31 | 12,869 | <input type="checkbox"/> | 293.0 | 192.5 | 1,674 | - | 11,844 | -8.0% |
| 11/01/07 | 11/30/07 | 30 | 8,430 | <input type="checkbox"/> | 782.5 | 4.5 | 1,440 | - | 11,437 | 35.7% |
| 12/01/07 | 12/31/07 | 31 | 14,439 | <input checked="" type="checkbox"/> | 1162.5 | 0.0 | 1,488 | - | 14,368 | -0.5% |
| 01/01/08 | 01/31/08 | 31 | 14,419 | <input checked="" type="checkbox"/> | 1134.5 | 0.5 | 1,488 | - | 14,168 | -1.7% |
| 02/01/08 | 02/29/08 | 29 | 12,708 | <input checked="" type="checkbox"/> | 1051.5 | 0.0 | 1,392 | - | 13,173 | 3.7% |
| 03/01/08 | 03/31/08 | 31 | 13,110 | <input checked="" type="checkbox"/> | 970.5 | 0.0 | 1,488 | - | 12,941 | -1.3% |
| 04/01/08 | 04/30/08 | 30 | 7,784 | <input checked="" type="checkbox"/> | 491.5 | 58.5 | 720 | - | 7,829 | 0.6% |
| 05/01/08 | 05/31/08 | 31 | 9,038 | <input checked="" type="checkbox"/> | 258.0 | 210.0 | 744 | - | 8,815 | -2.5% |
| 06/01/08 | 06/30/08 | 30 | 9,495 | <input checked="" type="checkbox"/> | 38.0 | 496.5 | - | - | 9,644 | 1.6% |
| 07/01/08 | 07/31/08 | 31 | 15,589 | <input checked="" type="checkbox"/> | 0.0 | 697.5 | 744 | - | 15,316 | -1.8% |
| Sum/Average/Max | | 366 | 144,401 | | 6320.5 | 2647.0 | 13,350 | - | 146,383 | 0% +/- 1.9% |

Natural Gas (Account # 4170121-4061358): Tuning Period is 366 days from 8/1/2007 until 7/31/2008.

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

Baseline (Therm) = 26.26 x #Days + 7.43 x HDD + 17.27 x CDD + 3.3 x Chiller-Ice Hours

The Baseline Equation has a Net Mean Bias of 0% and a Monthly Mean Error of +/-1.9%. The underlying regression has a R²=0.991

Baseline Costs are calculated using Average Total Cost/Consumption, but no less than \$1.242132/ Therm.

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

HDD = Heating Degree-Days calculated for ROCHESTERNH for a 63.0 F° balance point.

CDD = Cooling Degree-Days calculated for ROCHESTERNH for a 49.0 F° balance point.

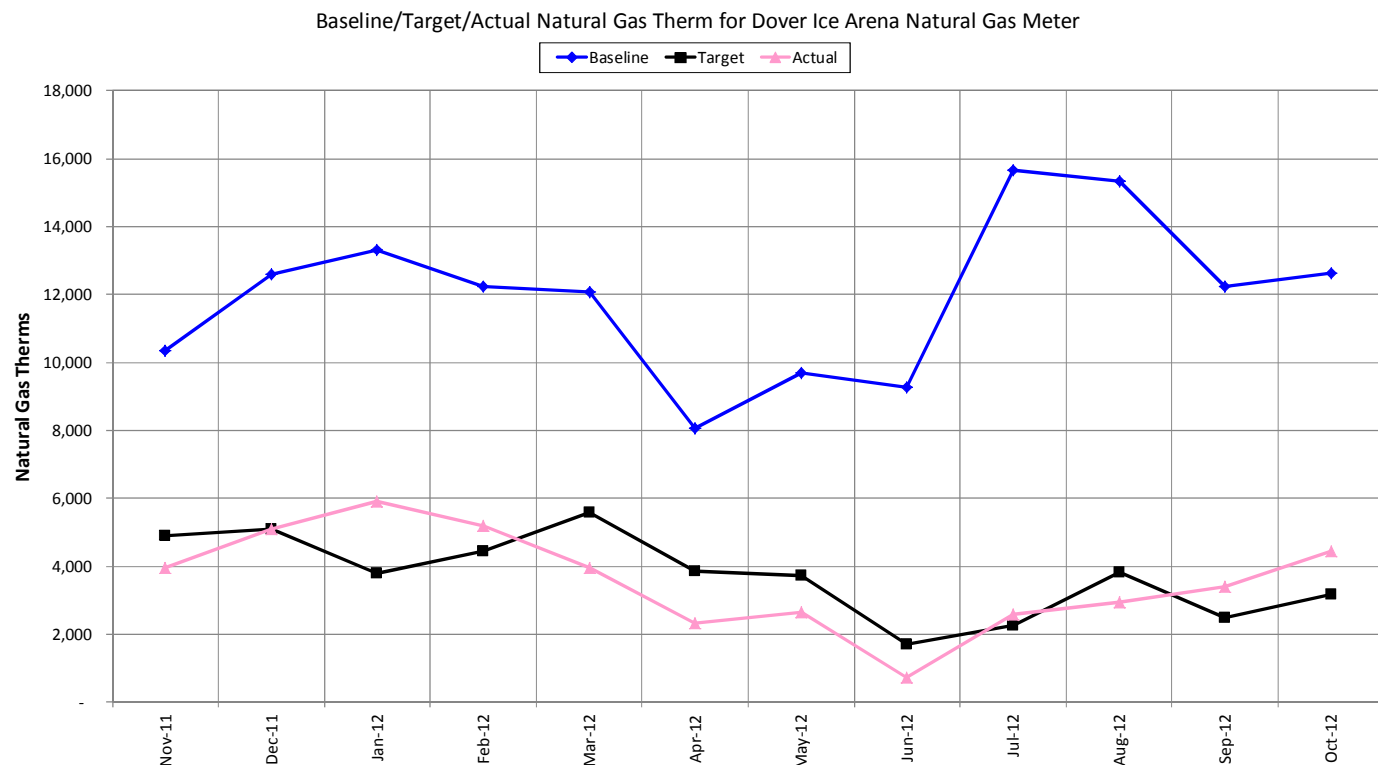
Multiplier is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

The regression has a R² value of 0.991 excluding two of the twelve baseline points, which is exceptionally better than required. As per the contract, the natural gas baseline is within 1.4% of the actual utility data complying with the necessary 2% mark.

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FIM 11: Ice Arena Upgrades- Natural Gas

This regression analysis graph was run for natural gas usage. The three lines shown represent the calculated baseline (blue), target utility use based off calculations and guarantees (black), and actual ice arena utility use from utility invoices (pink).

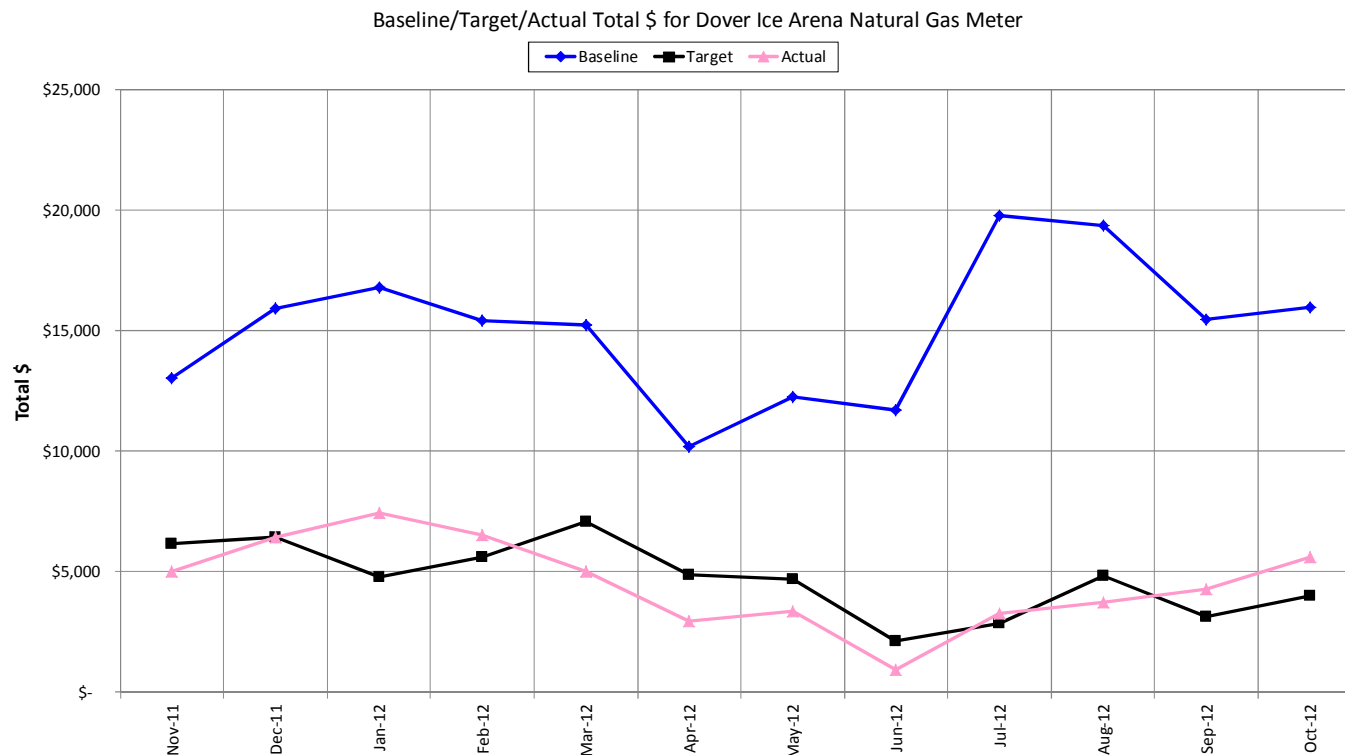


| Scenario | Nov-11 | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Total |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Baseline | 10,331 | 12,602 | 13,305 | 12,222 | 12,059 | 8,075 | 9,704 | 9,265 | 15,653 | 15,328 | 12,237 | 12,638 | 143,419 |
| Target | 4,889 | 5,090 | 3,802 | 4,437 | 5,587 | 3,862 | 3,730 | 1,697 | 2,268 | 3,827 | 2,483 | 3,162 | 44,834 |
| Actual | 3,956 | 5,092 | 5,911 | 5,183 | 3,955 | 2,323 | 2,665 | 742 | 2,599 | 2,959 | 3,384 | 4,433 | 43,202 |
| Savings | 6,374 | 7,509 | 7,394 | 7,039 | 8,104 | 5,752 | 7,039 | 8,523 | 13,054 | 12,369 | 8,853 | 8,205 | 100,217 |

APPENDIX A

FIM 11: Ice Arena Upgrades- Natural Gas

This regression analysis graph was run for natural gas cost. The three lines shown represent the calculated baseline (blue), target utility use based off calculations and guarantees (black), and actual ice arena utility cost from utility invoices and contractual rates (pink).



| Scenario | Nov-11 | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Total |
|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| Baseline | \$ 13,055 | \$ 15,926 | \$ 16,814 | \$ 15,446 | \$ 15,240 | \$ 10,205 | \$ 12,264 | \$ 11,709 | \$ 19,782 | \$ 19,371 | \$ 15,465 | \$ 15,971 | \$ 181,249 |
| Target | \$ 6,179 | \$ 6,433 | \$ 4,804 | \$ 5,607 | \$ 7,060 | \$ 4,881 | \$ 4,714 | \$ 2,145 | \$ 2,866 | \$ 4,836 | \$ 3,138 | \$ 3,996 | \$ 56,660 |
| Actual | \$ 5,000 | \$ 6,435 | \$ 7,470 | \$ 6,550 | \$ 4,998 | \$ 2,936 | \$ 3,368 | \$ 938 | \$ 3,285 | \$ 3,740 | \$ 4,277 | \$ 5,602 | \$ 54,598 |
| Savings | \$ 8,056 | \$ 9,490 | \$ 9,344 | \$ 8,896 | \$ 10,242 | \$ 7,269 | \$ 8,896 | \$ 10,772 | \$ 16,497 | \$ 15,632 | \$ 11,188 | \$ 10,369 | \$ 126,651 |

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FIM 11: Ice Arena Upgrades- Natural Gas

Since there are measures included at the Ice Arena that are not to be measured by utility bill analysis, they must be subtracted from the overall savings as to not be counted twice. Below is a table of Year 1 natural gas savings from all other measures at the Ice Arena:

| FIM 11: Ice Arena Upgrades | | |
|--------------------------------|-----------------|----------------|
| Year 1 Savings from Other FIMs | | |
| FIM # | Thermal Savings | |
| | MMBtu | Cost \$ |
| 1 | (62) | (\$779) |
| 2 | 0 | \$0 |
| 3 | 382 | \$4,827 |
| 6 | 53 | \$668 |
| 9 | 0 | \$0 |
| 12 | 0 | \$0 |
| 13 | 0 | \$0 |
| Total | 373 | \$4,716 |

Natural Gas consumption savings from the analysis are 100,463 therms for contract year 1. Of those, as seen in the table above, 373 MMBtu = 3,732 therms are from different measures within this project. So the total reported savings from FIM 11 in Contract Year 1 is 96,731 therms.

The natural gas cost savings from the analysis are \$126,651 with \$4,716 in savings coming from other FIMs. By isolating and removing savings from the other measures, the total FIM 11 natural gas utility analysis cost savings is \$121,935.

| FIM 11: Ice Arena Upgrades | | |
|--------------------------------------|-----------------|-----------|
| Guarantee Year 1 Energy Cost Savings | | |
| Building | Thermal Savings | |
| | MMBtu | Cost \$ |
| Ice Arena | 9,673 | \$121,935 |

APPENDIX A

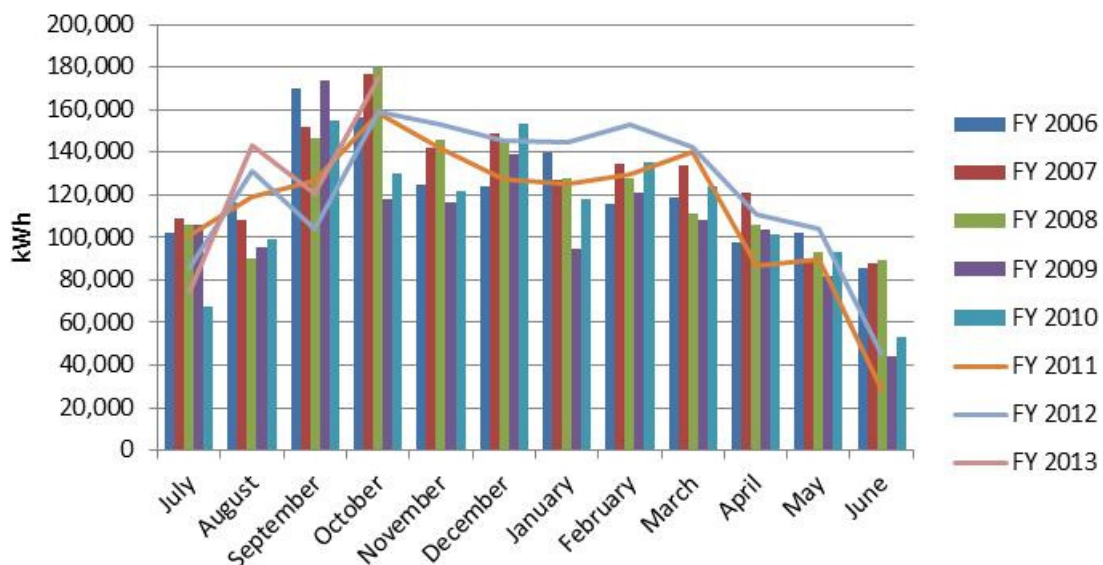
FIM 11: Ice Arena Upgrades- Electric

Electric

Savings from FIM 11 were obtained through utility bill analysis. Below is the electric consumption per month obtained from bills for the baseline year through the installation period. Baseline data is in green and year 1 contract data is in yellow.

| Dover Ice Arena Electric Consumption (kWh) | | | | | | |
|--|-----------|-----------|-----------|-----------|-----------|-----------|
| Month | 2007 - 08 | 2008 - 09 | 2009 - 10 | 2010 - 11 | 2011 - 12 | 2012 - 13 |
| September | 146,400 | 173,600 | 155,000 | 126,800 | 104,400 | 174,800 |
| October | 179,800 | 117,800 | 129,800 | 158,000 | 159,000 | 158,600 |
| November | 146,200 | 116,800 | 122,000 | 142,000 | 153,200 | - |
| December | 145,200 | 139,200 | 153,600 | 127,200 | 145,800 | - |
| January | 127,400 | 94,800 | 118,000 | 125,400 | 144,400 | - |
| February | 127,800 | 120,800 | 135,400 | 130,000 | 153,200 | - |
| March | 111,200 | 108,000 | 124,000 | 140,200 | 142,400 | - |
| April | 105,600 | 103,400 | 101,600 | 86,800 | 111,000 | - |
| May | 93,200 | 81,600 | 93,200 | 89,400 | 103,800 | - |
| June | 89,600 | 44,400 | 53,000 | 28,600 | 45,400 | - |
| July | 106,000 | 67,600 | 100,800 | 85,600 | 143,200 | - |
| August | 95,200 | 99,000 | 119,200 | 131,200 | 120,800 | - |

Dover Ice Arena- Monthly Electricity Usage



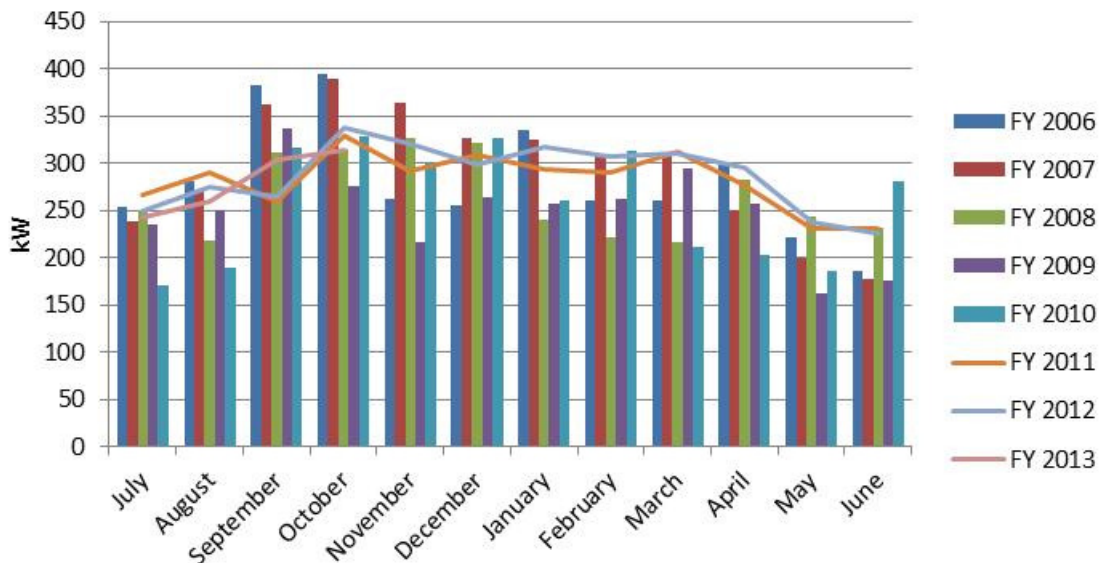
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FIM 11: Ice Arena Upgrades- Electric

Below is the electric demand per month obtained from bills from the baseline year through the installation period. Baseline data is in **green** and year 1 contract data is in **yellow**.

| Dover Ice Arena Electric Demand (kW) | | | | | | |
|--------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Month | 2007 - 08 | 2008 - 09 | 2009 - 10 | 2010 - 11 | 2011 - 12 | 2012 - 13 |
| September | 312 | 336 | 316 | 259 | 265 | 314 |
| October | 315 | 275 | 328 | 329 | 338 | 342 |
| November | 327 | 217 | 301 | 291 | 321 | - |
| December | 321 | 263 | 327 | 308 | 299 | - |
| January | 240 | 257 | 261 | 293 | 317 | - |
| February | 222 | 262 | 313 | 290 | 307 | - |
| March | 217 | 294 | 211 | 312 | 310 | - |
| April | 283 | 257 | 203 | 276 | 295 | - |
| May | 243 | 162 | 185 | 231 | 237 | - |
| June | 232 | 176 | 281 | 231 | 226 | - |
| July | 235 | 171 | 266 | 250 | 259 | - |
| August | 250 | 190 | 290 | 275 | 303 | - |

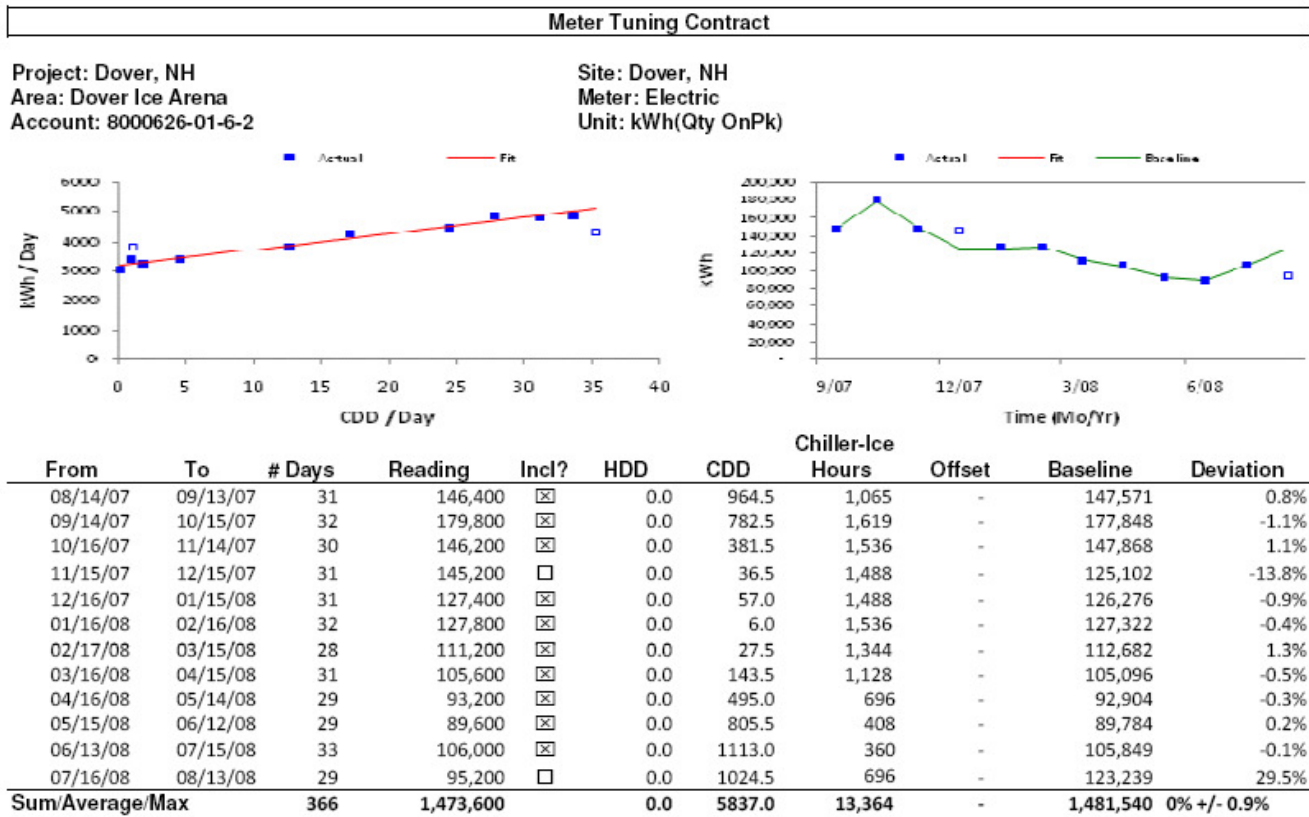
Dover Ice Arena- Monthly Electricity Demand



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FIM 11: Ice Arena Upgrades- Electric

Using Metrix regression analysis software, a electric consumption baseline was developed for the Ice Arena to be used in comparing bills with different weather and arena usage. The meter tuning contract for electric kWh is included below. This provides the calculation of how the baseline for electric consumption was developed.



Electric (Account # 8000626-01-6-2): Tuning Period is 366 days from 8/14/2007 until 8/13/2008.

Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

$$\text{Baseline (kWh)} = 483.36 \times \# \text{Days} + 57.29 \times \text{CDD} + 72.6 \times \text{Chiller-Ice Hours}$$

The Baseline Equation has a Net Mean Bias of 0% and a Monthly Mean Error of +/-0.9%. The underlying regression has a $R^2=0.998$
 Baseline Costs are calculated using Average Cost/Consumption, but no less than \$0.106/ kWh.

Explanations and Assumptions:

(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.

CDD = Cooling Degree-Days calculated for ROCHESTERNH for a 34.0 F^a balance point.

Multiplier is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

The regression has a R^2 value of 0.998 excluding two of the twelve baseline points, which is exceptionally better than required. As per the contract, the electric consumption baseline is within 0.5% of the actual utility data complying with the necessary 2% mark.

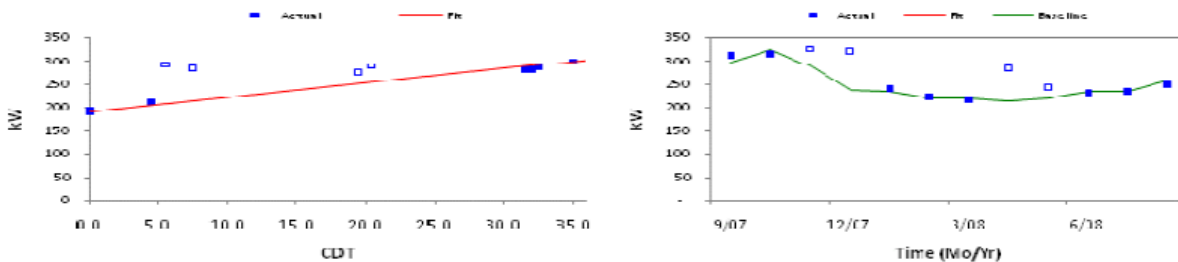
APPENDIX A

FIM 11: Ice Arena Upgrades- Electric

Using Metrix regression analysis software, a electric demand baseline was developed for the Ice Arena to be used in comparing bills with different weather and arena usage. The meter tuning contract for electric kW is included below. This provides the calculation of how the baseline for electric demand was developed.

| Meter Tuning Contract | |
|-----------------------|--|
|-----------------------|--|

| | |
|---|---|
| Project: Dover, NH Area: Dover Ice Arena Account: 8000626-01-6-2 | Site: Dover, NH Meter: Electric Unit: kW(Dmd OnPk) |
|---|---|



| From | To | # Days | Reading | Incl? | HDT | CDT | Chiller-Ice | | Offset | Baseline | Deviation |
|------------------------|----------|------------|--------------|-------------------------------------|------------|--------------|-------------|----------|----------|--------------|------------------|
| | | | | | | Hours | | | | | |
| 08/14/07 | 09/13/07 | 31 | 312 | <input checked="" type="checkbox"/> | 0.0 | 36.5 | 34 | - | - | 297 | -4.7% |
| 09/14/07 | 10/15/07 | 32 | 315 | <input checked="" type="checkbox"/> | 0.0 | 32.0 | 51 | - | - | 324 | 2.9% |
| 10/16/07 | 11/14/07 | 30 | 327 | <input type="checkbox"/> | 0.0 | 20.5 | 51 | - | - | 291 | -11.1% |
| 11/15/07 | 12/15/07 | 31 | 321 | <input type="checkbox"/> | 0.0 | 5.5 | 48 | - | - | 237 | -26.0% |
| 12/16/07 | 01/15/08 | 31 | 240 | <input checked="" type="checkbox"/> | 0.0 | 4.5 | 48 | - | - | 234 | -2.3% |
| 01/16/08 | 02/16/08 | 32 | 222 | <input checked="" type="checkbox"/> | 0.0 | 0.0 | 48 | - | - | 221 | -0.5% |
| 02/17/08 | 03/15/08 | 28 | 217 | <input checked="" type="checkbox"/> | 0.0 | 0.0 | 48 | - | - | 221 | 1.8% |
| 03/16/08 | 04/15/08 | 31 | 283 | <input type="checkbox"/> | 0.0 | 7.5 | 36 | - | - | 215 | -24.2% |
| 04/16/08 | 05/14/08 | 29 | 243 | <input type="checkbox"/> | 0.0 | 19.5 | 24 | - | - | 220 | -9.4% |
| 05/15/08 | 06/12/08 | 29 | 232 | <input checked="" type="checkbox"/> | 0.0 | 32.5 | 14 | - | - | 235 | 1.2% |
| 06/13/08 | 07/15/08 | 33 | 235 | <input checked="" type="checkbox"/> | 0.0 | 35.0 | 11 | - | - | 234 | -0.2% |
| 07/16/08 | 08/13/08 | 29 | 250 | <input checked="" type="checkbox"/> | 0.0 | 31.5 | 24 | - | - | 256 | 2.6% |
| Sum/Average/Max | | 366 | 3,197 | | 0.0 | 225.0 | 438 | - | - | 2,986 | 0% +/- 3% |

Electric (Account # 8000626-01-6-2): Tuning Period is 366 days from 8/14/2007 until 8/13/2008.
 Below is the equation used to calculate the Baseline values for the tuning period and all future periods:

$$\text{Baseline (kW)} = 101.35 + 3.03 \times \text{CDT} + 2.49 \times \text{Chiller-Ice Hours/Day}$$

The Baseline Equation has a Net Mean Bias of 0% and a Monthly Mean Error of +/-3%. The underlying regression has a $R^2=0.963$
 Baseline Costs are calculated using Average Cost/Demand, but no less than \$7.09/ kW.

Explanations and Assumptions:

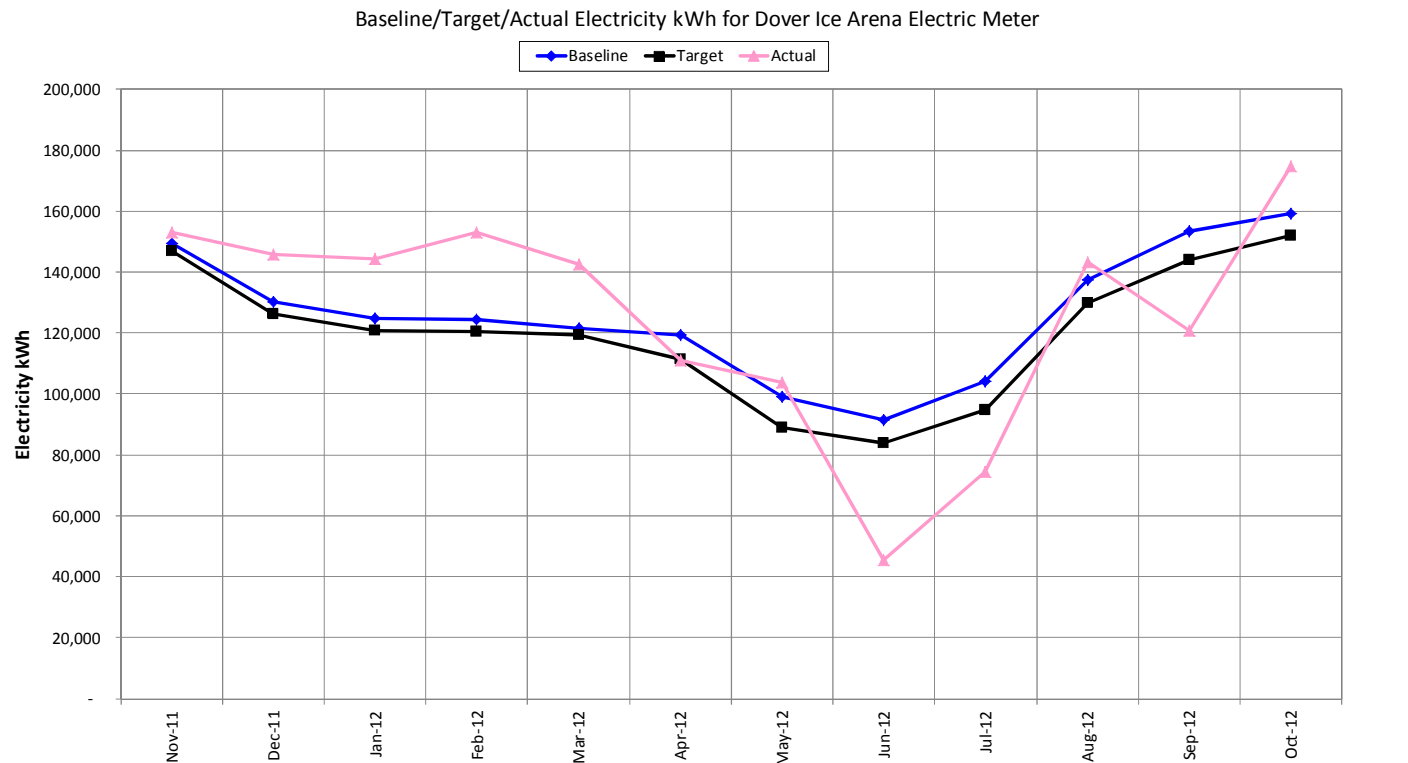
(empty checkbox) under 'Incl?' indicates that the bill is excluded from the regression. However the Baseline Equation is always applied for all billing periods, even those excluded from the regression.
 CDT = Cooling Delta T calculated for ROCHESTERNH for a 45.0 F° balance point.
 CDT was calculated using Maximum Temperatures.
 Multiplier is derived from Modification(s) in effect during the tuning period and is replicated annually for all future periods.

The regression has a R^2 value of 0.963 excluding four of the twelve baseline points, which is better than required. The electric consumption baseline is within 6.6% of the actual utility data. Since demand is not as cut and dry as other measures, it is difficult to determine a solution that would fall within the 2% difference. The difference of 4.6% is on the lower end of the baseline which in the end benefits the City of Dover. Johnson Controls accepts this difference and believes it is the best and most sensible option moving forward.

APPENDIX A

FIM 11: Ice Arena Upgrades- Electric

This regression analysis graph was run for electric kWh consumption. The three lines shown represent the calculated baseline (blue), target utility use based off calculations and guarantees (black), and actual ice arena utility use from utility invoices (pink).

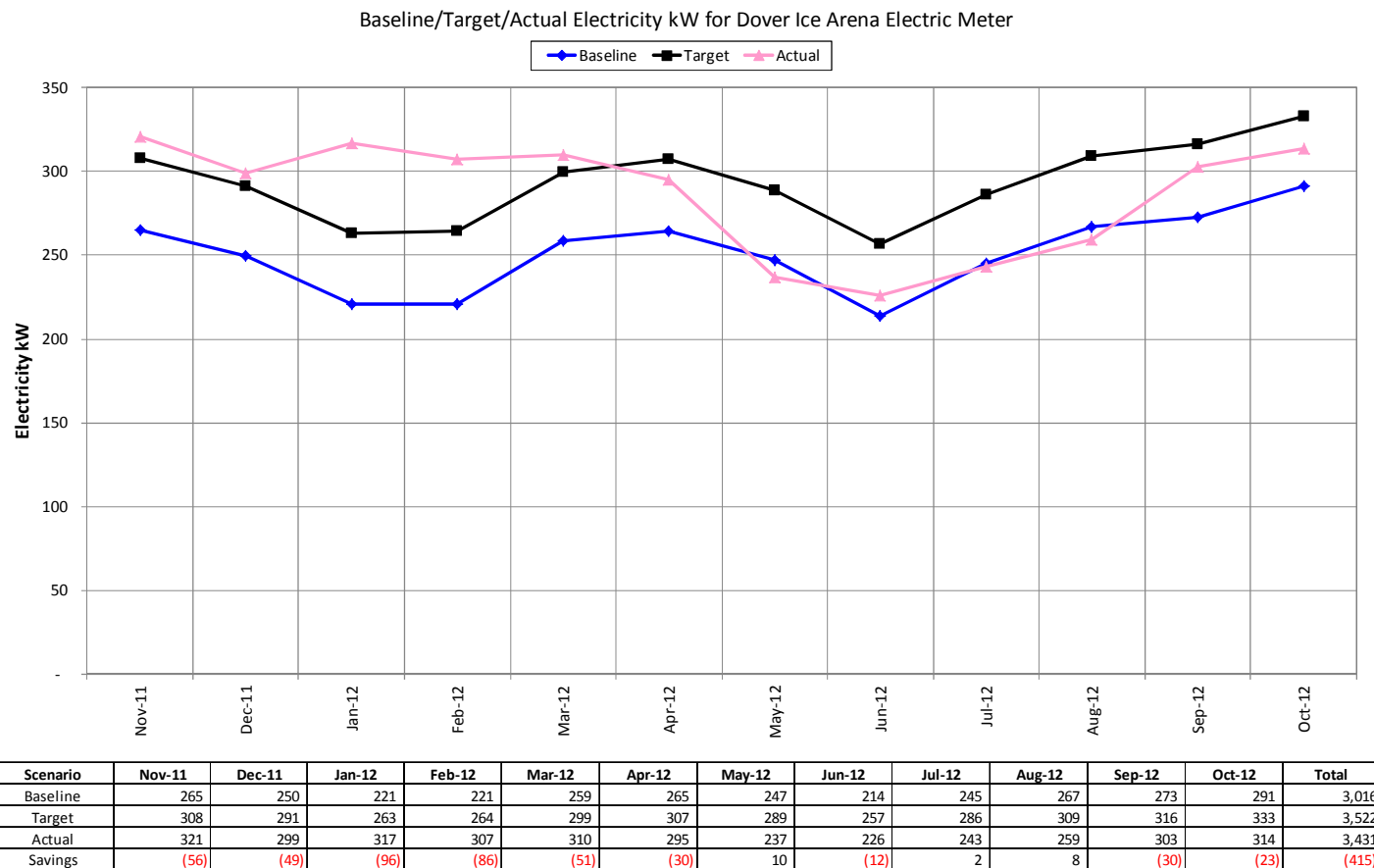


| Scenario | Nov-11 | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Total |
|----------|---------|----------|----------|----------|----------|---------|---------|--------|---------|---------|---------|----------|-----------|
| Baseline | 149,372 | 130,185 | 124,901 | 124,529 | 121,605 | 119,476 | 98,939 | 91,558 | 104,113 | 137,601 | 153,447 | 159,314 | 1,515,041 |
| Target | 146,969 | 126,173 | 120,703 | 120,526 | 119,510 | 111,344 | 89,096 | 83,878 | 94,613 | 129,976 | 144,161 | 152,018 | 1,438,966 |
| Actual | 153,200 | 145,800 | 144,400 | 153,200 | 142,400 | 111,000 | 103,800 | 45,400 | 74,400 | 143,200 | 120,800 | 174,800 | 1,512,400 |
| Savings | (3,828) | (15,615) | (19,499) | (28,671) | (20,795) | 8,476 | (4,861) | 46,158 | 29,713 | (5,599) | 32,647 | (15,486) | 2,641 |

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FIM 11: Ice Arena Upgrades- Electric

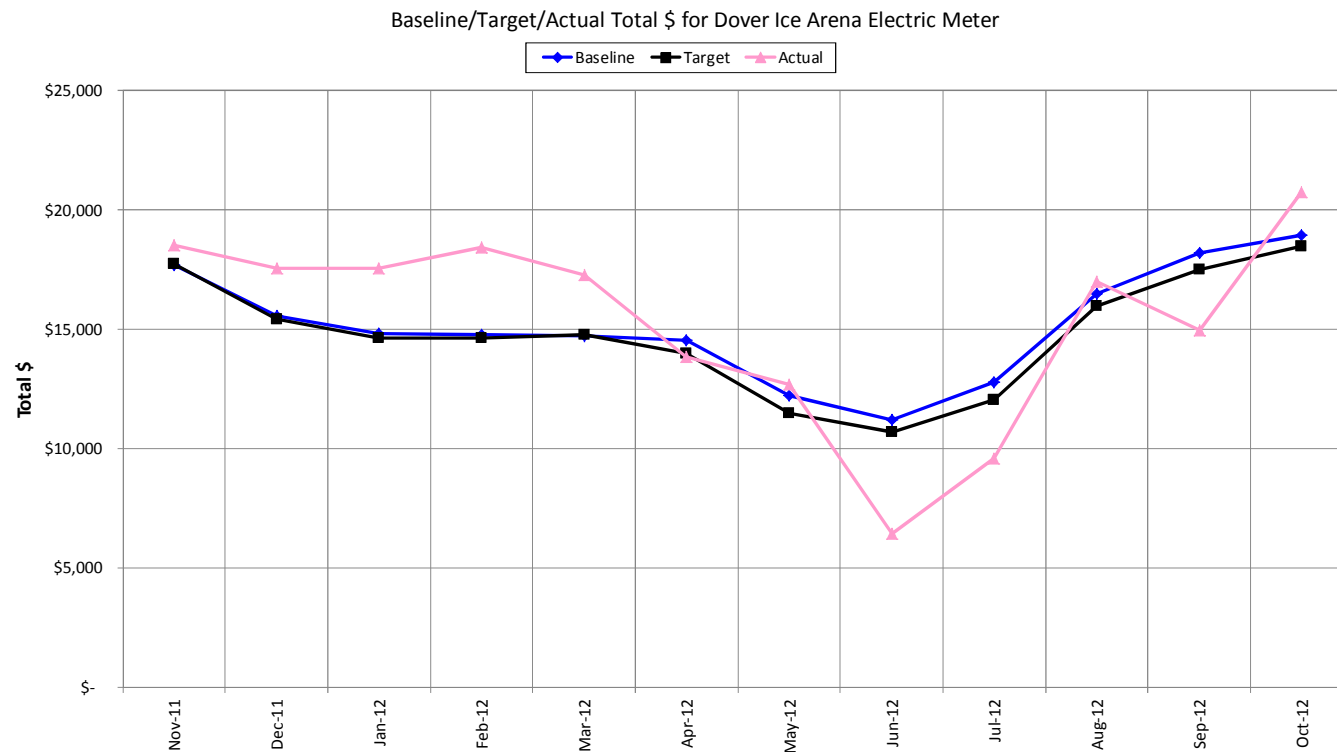
This regression analysis was run for electric kW demand. The three lines shown represent the calculated baseline (blue), target utility use based off calculations and guarantees (black), and actual ice arena utility use from utility invoices (pink).



APPENDIX A

FIM 11: Ice Arena Upgrades- Electric

This regression analysis was run for electric cost which includes both demand and consumption. The three lines shown represent the calculated baseline (blue), target utility use based off calculations and guarantees (black), and actual cost from utility invoices and contractual rates (pink).



| Scenario | Nov-11 | Dec-11 | Jan-12 | Feb-12 | Mar-12 | Apr-12 | May-12 | Jun-12 | Jul-12 | Aug-12 | Sep-12 | Oct-12 | Total |
|----------|-----------|------------|------------|------------|------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|
| Baseline | \$ 17,711 | \$ 15,569 | \$ 14,805 | \$ 14,766 | \$ 14,724 | \$ 14,540 | \$ 12,241 | \$ 11,222 | \$ 12,773 | \$ 16,479 | \$ 18,201 | \$ 18,950 | \$ 181,980 |
| Target | \$ 17,760 | \$ 15,437 | \$ 14,658 | \$ 14,650 | \$ 14,790 | \$ 13,981 | \$ 11,491 | \$ 10,711 | \$ 12,057 | \$ 15,968 | \$ 17,522 | \$ 18,475 | \$ 177,500 |
| Actual | \$ 18,515 | \$ 17,575 | \$ 17,554 | \$ 18,416 | \$ 17,292 | \$ 13,858 | \$ 12,683 | \$ 6,415 | \$ 9,609 | \$ 17,016 | \$ 14,953 | \$ 20,755 | \$ 184,640 |
| Savings | \$ (804) | \$ (2,006) | \$ (2,749) | \$ (3,650) | \$ (2,568) | \$ 682 | \$ (442) | \$ 4,807 | \$ 3,164 | \$ (537) | \$ 3,248 | \$ (1,805) | \$ (2,660) |

APPENDIX A

FIM 11: Ice Arena Upgrades- Electric

Again, since there are measures included at the Ice Arena that are not to be measured by utility bill analysis, they need to be subtracted from the overall savings as to not be counted twice. Below is a table of electric contract year savings from all other FIMs at the Ice Arena:

| FIM 11: Ice Arena Upgrades | | | |
|--------------------------------|---------------------|---------------|-----------------|
| Year 1 Savings from Other FIMs | | | |
| FIM # | Electricity Savings | | |
| | kW | kWh | Cost \$ |
| 1 | 142 | 52,196 | \$6,541 |
| 2 | 59 | 13,038 | \$1,382 |
| 3 | 0 | 3,719 | \$394 |
| 6 | 0 | 0 | \$0 |
| 9 | 0 | 3,004 | \$318 |
| 12 | 0 | 0 | \$0 |
| 13 | 59 | 22,816 | \$2,835 |
| Total | 259 | 94,773 | \$11,470 |

Electric consumption savings from the analysis is 2,641 kWh. Additionally 94,773 kWh are from different measures within this project. So the total reported additional usage from FIM 11 is 92,132 kWh.

Similarly, the electric demand savings from the graphical analysis are a 415 kW increase. 259 kW were saved from other measures not to be included in the FIM 11 utility bill analysis. This leaves a demand increase of 674 kW over the reporting period.

Lastly, electric cost savings from the regression analysis are an increase of \$2,660. Savings from other measures total electric savings of \$11,470. By isolating and removing the other FIM cost savings, the total FIM 11 electric utility analysis additional cost usage is \$14,130.

| FIM 11: Ice Arena Upgrades | | | |
|--------------------------------------|---------------------|----------|------------|
| Guarantee Year 1 Energy Cost Savings | | | |
| Building | Electricity Savings | | |
| | kW | kWh | Cost \$ |
| Ice Arena | (674) | (92,132) | (\$14,130) |

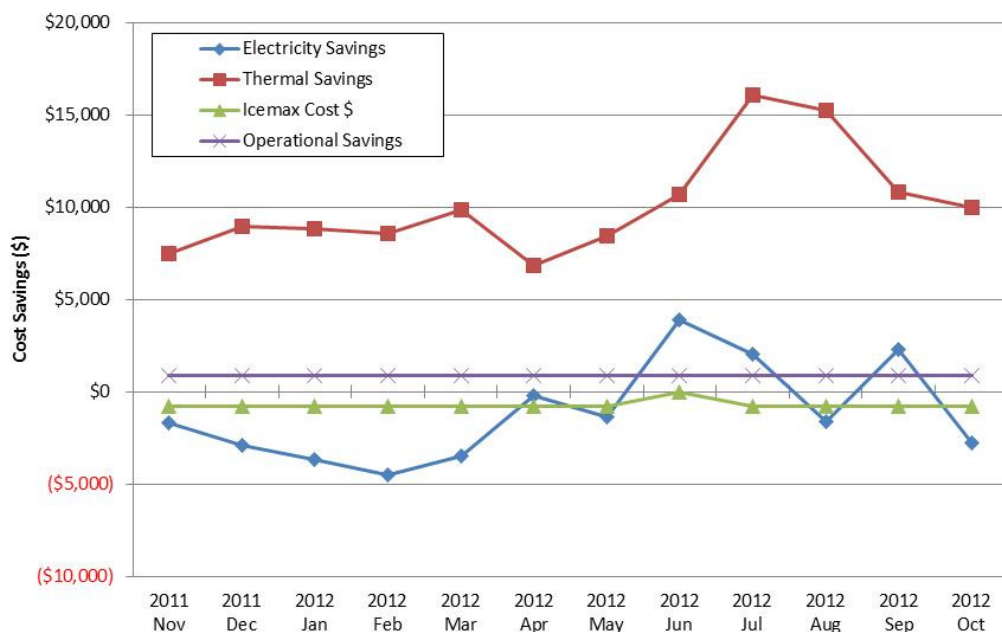
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FIM 11: Ice Arena Upgrades

Breaking out the energy savings on a monthly basis and combining all previous figures, the total FIM 11 savings for FY 2012 to Date are listed below:

| FIM 11: Ice Arena Upgrades | | | | | | | | | |
|--------------------------------------|------|---------------------|----------|------------|-----------------|-----------|-----------|------------|------------|
| Guarantee Year 1 Energy Cost Savings | | | | | | | | | |
| Month | Year | Electricity Savings | | | Thermal Savings | | Ice max | O&M | Total Cost |
| | | kW | kWh | Cost \$ | MMBtu | Cost \$ | Cost \$ | \$ Savings | \$ Savings |
| November | 2011 | (78) | (10,887) | (\$1,704) | 589 | \$7,476 | (\$785) | \$885 | \$5,872 |
| December | 2011 | (71) | (22,923) | (\$2,935) | 706 | \$8,946 | (\$811) | \$915 | \$6,115 |
| January | 2012 | (118) | (26,807) | (\$3,678) | 695 | \$8,815 | (\$811) | \$915 | \$5,241 |
| February | 2012 | (108) | (35,869) | (\$4,528) | 680 | \$8,588 | (\$759) | \$856 | \$4,157 |
| March | 2012 | (73) | (28,544) | (\$3,510) | 780 | \$9,864 | (\$811) | \$915 | \$6,457 |
| April | 2012 | (52) | 948 | (\$233) | 544 | \$6,881 | (\$785) | \$885 | \$6,748 |
| May | 2012 | (11) | (12,673) | (\$1,390) | 669 | \$8,453 | (\$811) | \$915 | \$7,167 |
| June | 2012 | (34) | 38,424 | \$3,870 | 849 | \$10,731 | \$0 | \$885 | \$15,486 |
| July | 2012 | (20) | 20,100 | \$2,051 | 1,282 | \$16,101 | (\$811) | \$915 | \$18,255 |
| August | 2012 | (14) | (15,091) | (\$1,637) | 1,213 | \$15,236 | (\$811) | \$915 | \$13,702 |
| September | 2012 | (52) | 24,667 | \$2,311 | 865 | \$10,833 | (\$785) | \$885 | \$13,244 |
| October | 2012 | (45) | (23,478) | (\$2,746) | 800 | \$10,011 | (\$811) | \$915 | \$7,369 |
| Contract Year 1 | | (674) | (92,132) | (\$14,130) | 9,673 | \$121,935 | (\$8,791) | \$10,800 | \$109,814 |

FIM 11- Ice Arena Savings



APPENDIX A

FIM 12: Power Factor Correction

Savings for FIM 12 will be obtained from the date of installation acceptance going forward. However, since this measure is not complete, there are no savings to report. Progress has been made to install the capacitors early on in calendar year 2013. Upcoming reports will update the progress of the installation of this measure.

| FIM 12: Power Factor Correction | | | | | |
|--------------------------------------|------|---------------------|----------|------------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | |
| Month | Year | Electricity Savings | | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | |
| November | 2011 | 0 | 0 | \$0 | \$0 |
| December | 2011 | 0 | 0 | \$0 | \$0 |
| January | 2012 | 0 | 0 | \$0 | \$0 |
| February | 2012 | 0 | 0 | \$0 | \$0 |
| March | 2012 | 0 | 0 | \$0 | \$0 |
| April | 2012 | 0 | 0 | \$0 | \$0 |
| May | 2012 | 0 | 0 | \$0 | \$0 |
| June | 2012 | 0 | 0 | \$0 | \$0 |
| July | 2012 | 0 | 0 | \$0 | \$0 |
| August | 2012 | 0 | 0 | \$0 | \$0 |
| September | 2012 | 0 | 0 | \$0 | \$0 |
| October | 2012 | 0 | 0 | \$0 | \$0 |
| Contract Year 1 | | 0 | 0 | \$0 | \$0 |

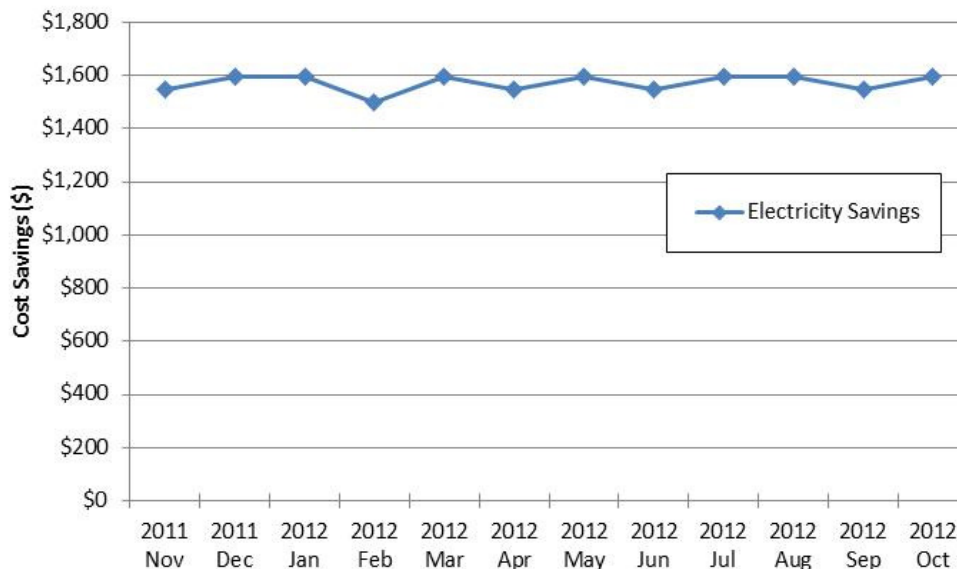
APPENDIX A

FIM 13: Transformers

The FIM 13 table breaks down the measure by month over the contract year. Savings for the replacement of transformers come from the Ice Arena, Waste Water Treatment Plant, Public Works, and McConnell Center.

| FIM 13: Transformers | | | | | |
|--------------------------------------|------|---------------------|---------|----------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | |
| Month | Year | Electricity Savings | | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | |
| November | 2011 | 27 | 12,380 | \$1,546 | \$1,546 |
| December | 2011 | 27 | 12,793 | \$1,597 | \$1,597 |
| January | 2012 | 27 | 12,793 | \$1,597 | \$1,597 |
| February | 2012 | 27 | 11,968 | \$1,496 | \$1,496 |
| March | 2012 | 27 | 12,793 | \$1,597 | \$1,597 |
| April | 2012 | 27 | 12,380 | \$1,546 | \$1,546 |
| May | 2012 | 27 | 12,793 | \$1,597 | \$1,597 |
| June | 2012 | 27 | 12,380 | \$1,546 | \$1,546 |
| July | 2012 | 27 | 12,793 | \$1,616 | \$1,616 |
| August | 2012 | 27 | 12,793 | \$1,616 | \$1,616 |
| September | 2012 | 27 | 12,380 | \$1,564 | \$1,564 |
| October | 2012 | 27 | 12,793 | \$1,616 | \$1,616 |
| Contract Year 1 | | 318 | 151,041 | \$18,858 | \$18,858 |

FIM 13- Transformers Savings



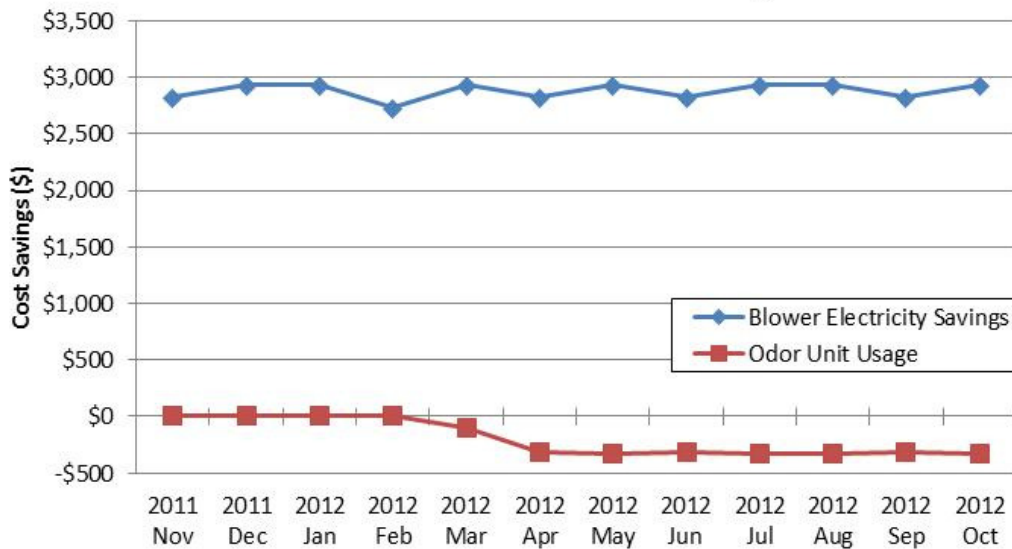
APPENDIX A

FIM 14: Aeration Blower Upgrade

The FIM 14 table breaks down the measure over the contract year. The aeration blowers at the waste water treatment facility were completed in August 2011. The silencer was added to the unit in March 2012 allowing for the recommended 24-7 run time to control odors. This has been included in the savings below.

| FIM 14: Aeration Blower Upgrade | | | | | |
|--------------------------------------|------|---------------------|---------|----------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | | |
| Month | Year | Electricity Savings | | | Total Cost \$ Savings |
| | | kW | kWh | Cost \$ | |
| November | 2011 | 64 | 23,070 | \$2,833 | \$2,833 |
| December | 2011 | 64 | 23,839 | \$2,927 | \$2,927 |
| January | 2012 | 64 | 23,839 | \$2,927 | \$2,927 |
| February | 2012 | 64 | 22,301 | \$2,738 | \$2,738 |
| March | 2012 | 60 | 22,944 | \$2,820 | \$2,820 |
| April | 2012 | 60 | 20,384 | \$2,511 | \$2,511 |
| May | 2012 | 60 | 21,064 | \$2,595 | \$2,595 |
| June | 2012 | 60 | 20,384 | \$2,511 | \$2,511 |
| July | 2012 | 60 | 21,064 | \$2,595 | \$2,595 |
| August | 2012 | 60 | 21,064 | \$2,595 | \$2,595 |
| September | 2012 | 60 | 20,384 | \$2,511 | \$2,511 |
| October | 2012 | 60 | 21,064 | \$2,595 | \$2,595 |
| Contract Year 1 | | 739 | 261,402 | \$32,158 | \$32,158 |

FIM 14- Aeration Blower Savings



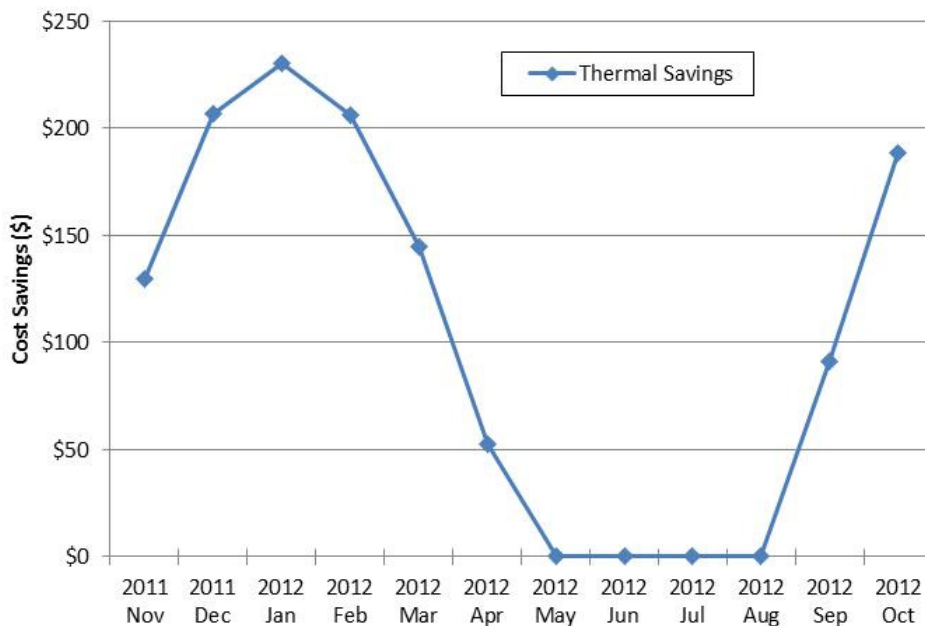
APPENDIX A

FIM 15: Boiler Replacement

Annual savings are concentrated over the winter months from mid-September through mid-April with a partial weighting for weather over that time.

| FIM 15: Boiler Replacement | | | | |
|--------------------------------------|------|-----------------|----------------|--------------------------|
| Guarantee Year 1 Energy Cost Savings | | | | |
| Month | Year | Thermal Savings | | Total Cost \$ Savings |
| | | MMBTU | Cost \$ | |
| November | 2011 | 9 | \$130 | \$130 |
| December | 2011 | 15 | \$207 | \$207 |
| January | 2012 | 16 | \$230 | \$230 |
| February | 2012 | 15 | \$207 | \$207 |
| March | 2012 | 10 | \$145 | \$145 |
| April | 2012 | 4 | \$53 | \$53 |
| May | 2012 | 0 | \$0 | \$0 |
| June | 2012 | 0 | \$0 | \$0 |
| July | 2012 | 0 | \$0 | \$0 |
| August | 2012 | 0 | \$0 | \$0 |
| September | 2012 | 6 | \$91 | \$91 |
| October | 2012 | 13 | \$189 | \$189 |
| Contract Year 1 | | 88 | \$1,251 | \$1,251 |

FIM 15- Boiler Replacement Savings



APPENDIX B

Performance Contract Project Progress

| City of Dover- Year 1 Performance Contracting Tracking | | | |
|--|---|----------------------------------|------------------------|
| Quarter | ⁽¹¹⁾ Annual Guaranteed Savings | Total Reported Savings | % Savings of Guarantee |
| 1 (Nov,Dec,Jan) | - | \$74,103 | 23.2% |
| 2 (Feb,Mar,Apr) | - | \$70,904 | 22.2% |
| 3 (May,Jun) | - | ⁽¹²⁾ \$54,245 | 17.0% |
| 4 (Jul,Aug,Sep,Oct) | - | ⁽¹³⁾ \$118,390 | 37.1% |
| Total | \$319,463 | ⁽¹⁴⁾ \$317,642 | 99.4% |

⁽¹¹⁾ Annual guaranteed savings are guaranteed on an annual basis

⁽¹²⁾ Number reflects a two month period vs. the previous quarter three month periods

⁽¹³⁾ Number reflects a four month period

⁽¹⁴⁾ Value reflects savings without implementation of FIM 12

Year 1 total reported savings to date include November 2011 through October 2012 as per the November 1st start date of the performance period.

| City of Dover Performance Contracting Tracking | | | | |
|--|-------------------|--|------------------|---------------------------|
| Period | Date Range | ⁽¹⁵⁾ Total Guaranteed Savings | Reported Savings | Variance |
| Installation | Sep '09 – Oct '11 | \$0 | \$400,730 | N/A |
| Year 1 | Nov '11 – Oct '12 | \$319,463 | \$317,642 | ⁽¹⁶⁾ (\$1,821) |
| Year 2 | Nov '12 – Oct '13 | \$328,236 | | |
| Year 3 | Nov '13 – Oct '14 | \$337,280 | | |
| Year 4 | Nov '14 – Oct '15 | \$346,603 | | |
| Year 5 | Nov '15 – Oct '16 | \$356,214 | | |
| Year 6 | Nov '16 – Oct '17 | \$366,122 | | |
| Year 7 | Nov '17 – Oct '18 | \$376,336 | | |
| Year 8 | Nov '18 – Oct '19 | \$386,865 | | |
| Year 9 | Nov '19 – Oct '20 | \$397,719 | | |
| Year 10 | Nov '20 – Oct '21 | \$408,909 | | |
| Total Contract | N/A | \$3,623,746 | N/A | N/A |

⁽¹⁵⁾ Guaranteed Savings baseline has been adjusted from original contract to reflect CO # 9236-0142-CO2 associated with the McConnell Center (added lighting and lighting controls)

⁽¹⁶⁾ Variance is due in part to non-installation of FIM 12- Power Factor Correction through Year 1

APPENDIX B

Weather Degree Days

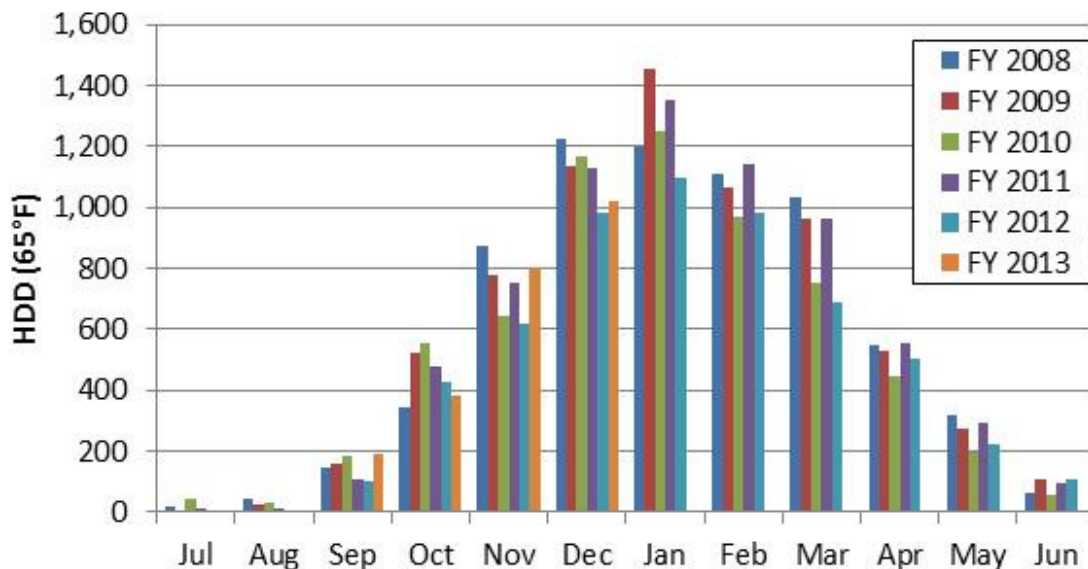
Weather data obtained from Skyhaven Airport Weather Station, Rochester, NH for Base 65°F.

Rochester, NH Weather Heating Degree Days (Base 65°F)

| Report Period | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 |
|---------------|---------|---------|---------|---------|---------|---------|
| July | 16.5 | 0.0 | 41.5 | 8.5 | 0.0 | 0.0 |
| August | 46.0 | 23.0 | 29.0 | 14.0 | 3.5 | 2.5 |
| September | 145.5 | 160.5 | 181.0 | 109.0 | 102.0 | 189.0 |
| October | 344.0 | 521.5 | 555.0 | 480.0 | 427.5 | 380.0 |
| November | 872.5 | 780.0 | 643.0 | 749.0 | 616.0 | 804.0 |
| December | 1,224.5 | 1,133.0 | 1,166.0 | 1,130.5 | 983.5 | 1,021.5 |
| January | 1,196.5 | 1,456.0 | 1,251.5 | 1,350.5 | 1,094.0 | |
| February | 1,109.5 | 1,064.5 | 968.5 | 1,141.5 | 981.5 | |
| March | 1,032.5 | 960.5 | 752.5 | 965.5 | 688.0 | |
| April | 550.5 | 529.0 | 445.0 | 552.5 | 502.0 | |
| May | 315.0 | 272.5 | 197.5 | 294.0 | 223.5 | |
| June | 63.0 | 108.5 | 55.5 | 97.0 | 106.0 | |

The baseline period is highlighted in green and year 1 contract period is yellow.

Monthly Heating Degree Days



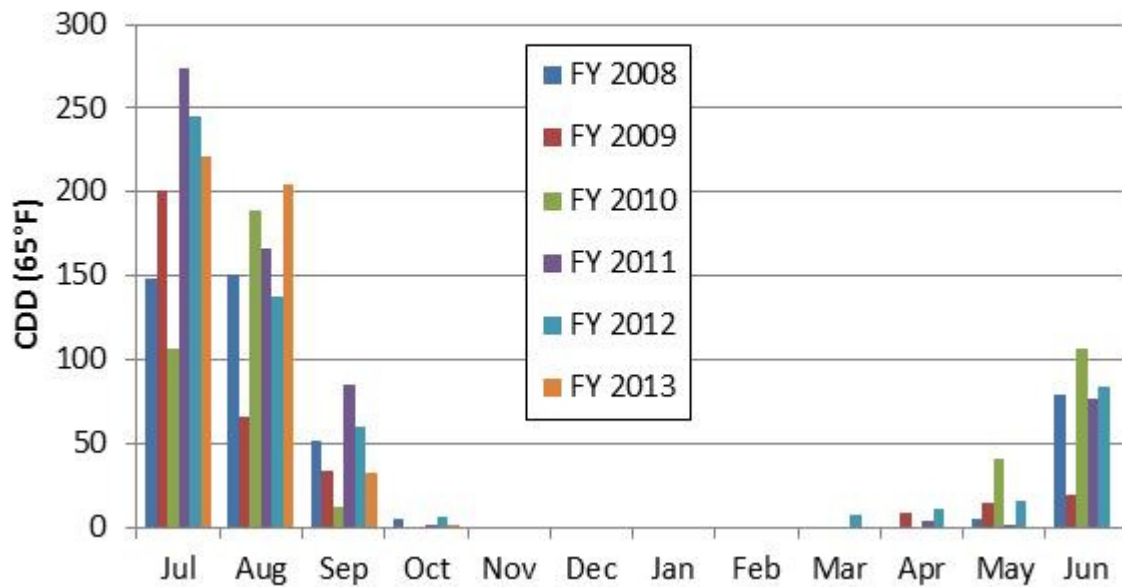
APPENDIX B

Rochester, NH Weather Cooling Degree Days (Base 65°F)

| Report Period | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 |
|---------------|---------|---------|---------|---------|---------|---------|
| July | 148.5 | 201.5 | 106.0 | 273.5 | 245.0 | 221.0 |
| August | 151.0 | 65.5 | 189.0 | 166.5 | 137.5 | 204.5 |
| September | 51.5 | 33.5 | 12.0 | 84.5 | 60.5 | 33.0 |
| October | 4.5 | 0.0 | 0.0 | 2.0 | 6.0 | 1.0 |
| November | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| December | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| January | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| February | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| March | 0.0 | 0.0 | 0.0 | 0.0 | 7.5 | |
| April | 0.0 | 8.0 | 0.0 | 3.5 | 11.0 | |
| May | 4.5 | 14.5 | 40.5 | 1.5 | 16.0 | |
| June | 79.5 | 19.0 | 107.0 | 77.0 | 84.0 | |

The baseline period is highlighted in green and year 1 contract period is yellow.

Monthly Cooling Degree Days



APPENDIX B

Utility Rate Schedule

Contractual utility rates were used in calculating savings throughout this report. Utility rates were obtained from Schedule C: Part III of the contract.

| Rate Summary Table | | | | | | | |
|--------------------------------|----------|---------|-------------|----------|----------|--------|--------|
| City of Dover, NH | Electric | | Natural Gas | Oil | Propane | Water | Sewer |
| Building Location | \$/kW | \$/kWh | \$/Therm | \$/Therm | \$/Therm | \$/HCF | \$/HCF |
| Indoor Pool | \$8.82 | \$0.104 | \$1.437 | - | - | \$3.75 | \$4.51 |
| Dover Ice Arena | \$7.09 | \$0.105 | \$1.264 | - | - | | |
| Waste Water Treatment Facility | \$7.03 | \$0.119 | - | \$1.667 | - | | |
| Dover City Hall | - | \$0.125 | - | \$1.667 | - | | |
| Public Works | - | \$0.128 | \$1.128 | - | - | | |
| McConnell Center | \$7.10 | \$0.107 | \$1.412 | - | - | | |
| Dover Public Library | - | \$0.135 | \$1.414 | - | - | | |
| Jenny Thompson Pool | - | \$0.126 | \$1.349 | - | - | | |
| Central Fire Station | - | \$0.125 | \$1.528 | - | - | | |
| South End Fire Station | - | \$0.128 | - | - | \$1.768 | | |
| Pine Hill Chapel | - | \$0.169 | - | \$1.667 | - | | |
| Pine Hill Barn | - | \$0.200 | - | \$1.667 | - | | |
| Veterans Hall | - | \$1.650 | \$1.803 | - | - | | |
| Dover Train Station | - | \$0.122 | \$1.913 | - | - | | |

Note: Unblended cost if demand charges are available, if not blended cost

The above contract rates for Oil and Propane are listed in \$/Therm. The below conversions are provided for both to give the rates in \$/Gallon:

Oil rate at \$1.667 per Therm = \$2.317 per Gallon

Propane rate at \$1.768 per Therm = \$1.619 per Gallon

APPENDIX B

Glossary

Actual Utility Usage (FIM 11)- Amount of electricity or natural gas used; Obtained from invoices received through utility companies

Baseline- The adjusted pre-retrofit bills (usually one year) used to compare to the post-retrofit energy usage in order to provide a basis for calculating savings; can be adjusted for variables such as weather, hours, etc.

Construction Period- The period between the commencement date and the first day of the month following the date of Substantial Completion

Contract Savings- Savings obtained over the course of the contract, in this case from the start of Year 1

Contract (Guarantee) Year Savings- Savings occurring over the course of a contract year; this contract's year runs from November through October

Cost Avoidance- Dollars that would have been spent if the energy conservation measures had not been installed.

Degree Day- A unit of measurement equal to a difference of one degree between the mean outdoor temperature on a certain day and a reference temperature (can be summed monthly or yearly). For example, a daily outdoor average temperature of 30°F would be 35 Heating Degree Days with a base temperature of 65°F.

FIM- Facility improvement measure, sometimes referred to as energy conservation measure (ECM)

Fiscal Year Savings- Savings occurring over the course of a fiscal year; Dover's runs from July through June

Guarantee Period- The period of time typically after the date of Substantial Completion. This period starts the reporting and monitoring of the performance contract.

Guaranteed Savings- The amount of savings guaranteed to be achieved.

Installation Savings- FIMs installed during the construction period and being of beneficial use prior to the date of Substantial Completion are monitored to determine savings.

Savings to Date- Savings obtained through a portion of a period

Substantial Completion- Sufficient materials and services have been provided to permit the intended benefit from the work. This term can apply to individual measures and the overall project.

Target Savings- Savings figures estimated to be achieved, determined by calculations and measurements

APPENDIX C

FIM 1- Lighting: Formulas & Calculations Used

$$\text{Lighting kW Savings} = \sum (\text{Fixture Wattage}_{\text{Pre}} - \text{Retrofit Fixture Wattage}_{\text{Post}})$$

$$\text{Lighting kWh Savings} = \sum (\text{Lighting kW Savings} \times \text{Hours of Operation})$$

$$\text{kWh Cooling Savings}_{\text{Period}} = \frac{\text{CDD}_{\text{Period}}}{\text{CDD}_{\text{Annual}}} \times \text{kWh Cooling Savings}_{\text{Annual}}$$

$$\text{MMBtu Heating Losses}_{\text{Period}} = \frac{\text{HDD}_{\text{Period}}}{\text{HDD}_{\text{Annual}}} \times \text{MMBtu Heating Losses}_{\text{Annual}}$$

FIM 2- Lighting Controls: Formulas & Calculations Used

$$\text{Lighting Controls kWh Savings} = \sum \text{Retrofit Fixture Wattage}_{\text{Post}} \times (\text{Lighting Runtime}_{\text{Pre}} - \text{Hours of Occupancy})$$

FIM 3- Weatherization: Formulas & Calculations Used

Spreadsheet based- General Formulas used include:

$$\text{CFM}_{\text{Infiltration}} [\text{Winter}] = \text{Wind Speed} \times \text{Area of Cracks} \times \% \text{ Area Heated} \times \% \text{ Windward Diversity}$$

$$\text{CFM}_{\text{Infiltration}} [\text{Summer}] = \text{Wind Speed} \times \text{Area of Cracks} \times \% \text{ Area with AC} \times \% \text{ Windward Diversity}$$

$$\text{Existing Btu Saved}_{\text{Occupied}} = 1.08 \times \text{CFM}_{\text{Infiltration}} \times \Delta T \times \text{Bin Hours}_{\text{Occupied}}$$

$$\text{Existing Btu Saved}_{\text{Unoccupied}} = 1.08 \times \text{CFM}_{\text{Infiltration}} \times \Delta T \times \text{Bin Hours}_{\text{Unoccupied}}$$

$$\text{kWh Saved} = \frac{\text{Cooling Btu Saved} \times 12}{12,000 \frac{\text{Btu}}{\text{Ton}} \times \text{EER}}$$

$$\text{MMBtu Saved} = \frac{\text{Heating Btu Saved}}{1 \times 10^6 \frac{\text{Btu}}{\text{MMBtu}} \times \text{Boiler Efficiency} (\%)}$$

APPENDIX C

FIM 4.1- EMS Building Controls: Formulas & Calculations Used

Spreadsheet based- General Formulas used include:

$$\text{Cooling kWh} = \frac{(\text{Envelope Load} + \text{Infiltration Load}) \times \frac{1 \times 10^6 \text{ Btu}}{\text{MMBtu}} \times \text{Cooling} \frac{\text{kW}}{\text{Ton}}}{12,000 \frac{\text{Tons}}{\frac{\text{Btu}}{\text{Hr}}}}$$

$$\text{Heating MMBtu} = \frac{(\text{Envelope Load} + \text{Infiltration Load})}{\text{Boiler Efficiency (\%)}}$$

$$\begin{aligned} \text{Envelope Load} = & \frac{1}{\text{Rvalue}} \times \text{Exposed Area} \times \left[\sum (\text{Air Temp}_{\text{Outdoor}} - \text{Setpoint}_{\text{Occupied}}) \times \text{Occupied Hours} \right. \\ & \left. + \sum (\text{Air Temp}_{\text{Outdoor}} - \text{Setpoint}_{\text{Unoccupied}}) \times \text{Unoccupied Hours} \right] \end{aligned}$$

$$\begin{aligned} \text{Infiltration Load} = & \frac{1.08 \times \text{Infiltration CFM}}{1 \times 10^6} \times \left[\sum (\text{Air Temp}_{\text{Outdoor}} - \text{Setpoint}_{\text{Occupied}}) \times \text{Occupied Hours} \right. \\ & \left. + \sum (\text{Air Temp}_{\text{Outdoor}} - \text{Setpoint}_{\text{Unoccupied}}) \times \text{Unoccupied Hours} \right] \end{aligned}$$

FIM 4.2- EMS Building Controls/ Optimal Start: Formulas & Calculations Used

Spreadsheet based- General Formulas used include:

$$\text{Baseline MMBtu} = 1.08 \times \text{CFM} \times \% \text{ Speed at Warmup} \times (\text{Air Temp}_{\text{Outdoor}} - \text{Air Temp}_{\text{Room}}) \times \text{Warmup Hours}$$

$$\text{Proposed MMBtu} = \frac{\frac{\text{Envelope Load} + \text{Infiltration Load}}{1 \times 10^6} \times \text{Warmup Hours}}{\text{Morning Run Hours}}$$

$$\text{Warmup Hours} = \text{Hours before Occupancy Unit Ventilators Turned to Occupied Mode}$$

$$\text{MMBtu Savings} = \frac{\text{Baseline MMBtu} - \text{Propose MMBtu}}{\text{Boiler Efficiency (\%)}}$$

APPENDIX C

FIM 4.3-AHU Upgrade / VFD on Fan: Formulas & Calculations Used

Spreadsheet based- General Formulas used include:

$$\text{Cooling kWh} = \frac{\left(\text{Sensible Cooling} \left(\frac{\text{Btu}}{\text{Hr}} \right) + \text{Latent Cooling} \left(\frac{\text{Btu}}{\text{Hr}} \right) \right) \times \text{Cooling} \frac{\text{kW}}{\text{Ton}} \times \text{Bin Hours}}{12,000 \frac{\text{Tons}}{\frac{\text{Btu}}{\text{Hr}}}}$$

$$\text{Sensible Cooling} \left(\frac{\text{Btu}}{\text{Hr}} \right) = 1.08 \times \text{CFM}_{\text{Mixed Air}} \times (\text{Temp}_{\text{Mixed Air}} - \text{Temp}_{\text{Cooling Coil}})$$

$$\text{Latent Cooling} \left(\frac{\text{Btu}}{\text{Hr}} \right) = 0.68 \times \text{CFM}_{\text{Mixed Air}} \times (\text{Relative Humidity}_{\text{Mixed Air}} - \text{RH Setpoint}_{\text{Discharge Air}})$$

$$\text{Heating MMBtu} = \frac{\text{Preheat} \left(\frac{\text{Btu}}{\text{Hr}} \right) + \text{Reheat} \left(\frac{\text{Btu}}{\text{Hr}} \right)}{1 \times 10^6 \text{ Boiler Efficiency (\%)}} \times \text{Bin Hours}$$

$$\text{Preheat} \left(\frac{\text{Btu}}{\text{Hr}} \right) = 1.08 \times \text{CFM}_{\text{Mixed Air}} \times (\text{Temp}_{\text{Preheat Coil}} - \text{Temp}_{\text{Mixed Air}})$$

$$\text{Reheat} \left(\frac{\text{Btu}}{\text{Hr}} \right) [\text{Cooling Season}] = 1.08 \times \text{CFM}_{\text{Mixed Air}} \times (\text{Temp}_{\text{Discharge Air; Summer}} - \text{Temp}_{\text{Cooling Coil}})$$

$$\begin{aligned} \text{Reheat} \left(\frac{\text{Btu}}{\text{Hr}} \right) [\text{Heating Season}] \\ = 1.08 \times \text{CFM}_{\text{Mixed Air}} \times [\text{Temp}_{\text{Discharge Air; Winter}} - \text{Max}(\text{Temp}_{\text{Preheat Coil}}, \text{Temp}_{\text{Mixed Air}})] \end{aligned}$$

$$\text{CFM}_{\text{Mixed Air}} = \text{CFM}_{\text{Total Supply}} \times \% \text{ Fan Speed}$$

$$\text{Temp}_{\text{Mixed Air}} = \frac{\text{CFM}_{\text{Outside Air}}}{\text{CFM}_{\text{Mixed Air}}} \times \text{Temp}_{\text{Outside Air}} + \frac{\text{CFM}_{\text{Return Air}}}{\text{CFM}_{\text{Mixed Air}}} \times \text{Temp}_{\text{Return Air}}$$

$$\text{Relative Humidity}_{\text{Mixed Air}} = \frac{\text{CFM}_{\text{Outside Air}}}{\text{CFM}_{\text{Mixed Air}}} \times \text{RH}_{\text{Outside Air}} + \frac{\text{CFM}_{\text{Return Air}}}{\text{CFM}_{\text{Mixed Air}}} \times \text{RH}_{\text{Return Air}}$$

APPENDIX C

FIM 4.4- Pool Dehumidification: Formulas & Calculations Used

Spreadsheet based-

See DEA Appendix for Calculations

FIM 4.5- Snow Melt Sensor: Formulas & Calculations Used

Spreadsheet based-

See DEA Appendix for Calculations

FIM 6- Water Conservation: Formulas & Calculations Used

$$\text{Water Savings} = \sum (\text{Fixture Water Flow}_{\text{Pre}} - \text{Retrofit Fixture Water Flow}_{\text{Post}})$$

$$\text{Water Cost Savings} = \sum (\text{Water Savings}) \times \text{Fixture Usage}$$

APPENDIX C

FIM 9- Vending Controls: Formulas & Calculations Used

$$\text{Electric Savings} = \sum (\text{Energy Usage}_{\text{Pre}} - \text{Energy Usage}_{\text{Post}})$$

$$\text{Energy Usage} = \sum (\text{Lighting kWh} + \text{Compressor kWh})$$

$$\text{Lighting}_{\text{Pre}} \text{ kWh} = \sum (\text{Lighting kW} \times \text{Hours per Day} \times \text{Days per Year})$$

$$\text{Lighting}_{\text{Post}} \text{ kWh} = \sum \text{Lighting kW} \times (\text{Hours}_{\text{Occupied}} + (\text{Hours}_{\text{Unoccupied}} \times \text{Night Duty Cycle}))$$

$$\text{Compressor Hours}_{\text{Post}} = \sum (\text{Hours}_{\text{Occupied}} \times \text{Existing Duty Cycle}) + (\text{Hours}_{\text{Unoccupied}} \times \text{Night Duty Cycle})$$

$$\text{Compressor}_{\text{Pre}} \text{ kWh} = \sum \left(\frac{\text{Volts} \times \text{Amps} \times 80\% \text{ P. F.}}{\frac{1,000 \text{ W}}{1 \text{ kW}}} - \text{Lighting kW} \right) \times \frac{\text{Hours}_{\text{Pre}}}{\text{Year}} \times \text{Duty Cycle}$$

$$\text{Compressor}_{\text{Post}} \text{ kWh} = \sum \left(\frac{\text{Volts} \times \text{Amps} \times 80\% \text{ P. F.}}{\frac{1,000 \text{ W}}{1 \text{ kW}}} - \text{Lighting kW} \right) \times \frac{\text{Compressor Hours}_{\text{Post}}}{\text{Year}}$$

FIM 10- Pool Cover: Formulas & Calculations Used

Spreadsheet based-

See DEA Appendix for Calculations

FIM 11- Ice Arena Upgrades: Formulas & Calculations Used

Savings based on Utility Invoices & Metrix Meter Tuning Contracts contained in previous sections of this report.

APPENDIX C

FIM 12- Power Factor: Formulas & Calculations Used

No Current Savings

FIM 13- Transformers: Formulas & Calculations Used

$$\text{Electric Savings} = \sum (\text{Transformer Losses}_{\text{Pre}} - \text{Transformer Losses}_{\text{Post}})$$

$$\text{Transformer Losses} = \sum [\text{kVA} \times \text{Load} \times \text{Load Factor} \times (\frac{1}{\% \text{ Efficiency}} - 1)]$$

FIM 14- Aeration Blowers: Formulas & Calculations Used

$$\text{Electric Savings} = \text{kWh Use}_{\text{Pre}} - \text{kWh Use}_{\text{Post}}$$

$$\text{kWh Use} = \frac{\text{Voltage} \times \text{Amperage} \times \text{PF} \times \sqrt{3}}{\frac{1,000 \text{ W}}{\text{kW}}} \times \text{Hours}$$

FIM 15- Boiler Replacement: Formulas & Calculations Used

$$\text{Fuel Savings} = \text{Fuel Usage} \times \frac{\text{Fuel to Heat Efficiency}_{\text{Pre}}}{\text{Fuel to Heat Efficiency}_{\text{Post}}}$$

$$\text{Fuel to Heat Efficiency (\%)} = \text{Combustion Efficiency} \times (1 - \text{Radiant Jacket Losses}) \times (1 - \text{Distribution Losses})$$