Worksession Item

CITY OF NEW BRIGHTON

MEMORANDUM

DATE: May 6, 2014

TO: Mayor and Members of the City Council
Dean Lotter, City Manager

FROM: Grant Wyffels, Director of Public Works GMW

SUBJECT: May 13, 2014 City Council Worksession – Johnson Controls Energy Study

The City has been working with Johnson Controls since October of 2012. They have looked at all of our significant City facilities to determine if we can reduce our energy footprint. They have performed a preliminary analysis related to building infrastructure and identified opportunities for savings and efficiencies. Their focus was mainly on central plant/HVAC, lighting, building automation, water conservation, and other building envelope concepts. Johnson Controls last met with the City Council at the July 9, 2013 Worksession. At that time the Council requested more time to internally discuss the options further prior to making a decision to move forward with the Project Development Agreement. Johnson Controls will again present their findings and recommendations to the Council.

Staff will be looking for consensus from the Council to either direct staff to prepare a Council Report to continue to work with Johnson Controls and move forward with a Project Develop Agreement (PDA) or to pass at this time.

The PDA will allow Johnson Controls to develop a final portfolio of improvement opportunities for facility and financial performance.

Attachments:

Project Development Agreement
Power Point Presentation
Example from Rochester, MN

Project Development Agreement

BETWEEN

City of New Brighton		***Johnson Controls, Inc.***
803 Old Hwy 8 NW	**AND**	***2605 Fernbrook Lane N***
New Brighton, MN 55112		***Plymouth, MN 55447***

The City of New Brighton has worked with Johnson Controls, Inc. (JCI) to develop a self-funding approach to aid in facility renewal and operational cost reduction. The objective is to achieve energy conservation, operational savings and performance improvements through a defined Energy Stewardship program.

The purpose of this Project Development Agreement (PDA) is to confirm the intent of JCI and New Brighton to develop a portfolio of Energy Conservation and Facility Improvement Measures (FIMs) intended to improve facility and financial performance. This agreement will provide the basis of the scope of the PDA, the obligations of both parties, the financial metrics to be met, intended outcomes and timeline.

1. Scope of Work

It is the Parties' mutual understanding that this PDA will enable an analysis of costs and related energy and other operational savings for FIMs. In collaboration with New Brighton management, Johnson Controls will develop a comprehensive portfolio of FIMs, which will be entirely self-funding over a period of 20 years or less, and include a pro-forma business case analysis. The full range of options explored will include, but not be limited to: a) lighting and other electrical systems; b) heating, ventilation, and air conditioning systems; c) building automation systems, d) plumbing systems, and e) best-in-class building technologies and **other lifecycle management practices. See potential FIMs contained within Johnson Controls'** preliminary report. The scope of work can be adjusted (increased or decreased) during the final, detailed development phase; however, the same financial criterion will be maintained which results in moving forward to implementation.

2. Records & Data

During this program development phase, New Brighton will furnish to Johnson Controls, upon its request, accurate and complete data concerning current costs, budgets, facilities requirements, future projected loads, accurate square footage, facility operating requirements, equipment service agreements, etc.

3. Price & Payment Terms

New Brighton agrees to pay to Johnson Controls **$19,950.00** within 60 days after the delivery of the list of FIMs, the pro-forma financial analysis and associated report described under paragraph 1 of this Agreement. However, New Brighton will have **NO** obligation to pay this amount if:

1. **Johnson Controls and New Brighton enter in the "Implementation Contract" within 60 days** after the delivery to the Customer of the documentation described under paragraph 1 of this Agreement. Costs for the study will be transferred to the total cost of the Implementation Contract and subject to the payment terms outlined in the Contract.

2. The project benefits do not offset the cost of the project with a payback period of 20 years or less. Project benefits shall include, but not be limited to utility cost avoidance, negotiated utility rate reductions, operating and maintenance cost avoidance, capital cost avoidance and utility revenue increases.

4. Indemnity

Johnson Controls and New Brighton agree that Johnson Controls shall be responsible only for such injury, loss, or damage caused by the intentional misconduct or the negligent act or omission of Johnson Controls. To the extent permitted by law, Johnson Controls and New Brighton agree to indemnify and to hold each other, including their officers, agents, directors, and employees, harmless from all claims, demands, or suits of any kind, including all legal costs and attorney's fees, resulting from the intentional misconduct of their employees or any negligent act or omission by their employees or agents. Neither Johnson Controls nor New Brighton will be responsible to the other for any special, indirect, or consequential damages.

5. Disputes

If a dispute arises under this Agreement, the parties shall promptly attempt in good faith to resolve the dispute by negotiation. All disputes not resolved by negotiation shall be resolved in accordance with the Commercial Rules of the American Arbitration Association in effect at the time, except as modified herein. All disputes shall be decided by a single arbitrator. A decision shall be rendered by the arbitrator no later than nine months after the demand for arbitration is filed, and the arbitrator shall state in writing the factual and legal basis for the award. No discovery shall be permitted. The arbitrator shall issue a scheduling order that shall not be modified except by the mutual agreement of the parties. Judgment may be entered upon the award in the highest State or Federal court having jurisdiction over the **matter. The prevailing party shall recover all costs, including attorney's fees, incurred as a** result of this dispute.

6. Confidentiality

This agreement creates a confidential relationship between Johnson Controls and New Brighton. Both parties acknowledge that while performing this Agreement, each will have access to confidential information, including but not limited to systems, services or planned services, suppliers, data, financial information, computer software, processes, methods, knowledge, ideas, marketing promotions, current or planned activities, research, **development, and other information relating to the other party ("Proprietary Information").** Except as authorized in writing, both parties agree to keep all Proprietary Information confidential. Johnson Controls may only make copies of Proprietary Information necessary for performing its services. Upon cessation of services, termination or expiration of this

Agreement, or **upon either party's request, whichever is earlier, both parties will return all such** information and all documents, data and other materials in their control that contain or relate to such Proprietary Information.

Johnson Controls and New Brighton understand that this is a confidential project, and agree to keep and maintain confidentiality regarding its undertaking of this project. Johnson Controls shall coordinate its services only through the designated New Brighton representative, and shall provide information regarding this project to only those persons approved by New Brighton. Johnson Controls will be notified in writing of any changes in the designated New Brighton Representative.

7. Timeline

It is the intent and commitment of all parties identified in this Agreement to work diligently, and cause others under their direction to work diligently toward meeting the following timeline:

- Signed Project Development Agreement (PDA) – May 2014
- Johnson Controls and New Brighton will meet to verify FIMs and methodologies validating the associated savings - 90 Calendar Days after PDA Execution
- Johnson Controls presents to, and New Brighton approves, the final Scope of Work and Business Case Pro-forma(s) - 120 Calendar Days after PDA Execution
- New Brighton executes Performance Contracting Agreement - 150 Calendar Days after PDA Execution

8. Miscellaneous Provisions

This Agreement cannot be assigned by either party without the prior written consent of the other party. This Agreement is the entire Agreement between Johnson Controls, Inc. and the City of New Brighton, and supersedes any prior oral understandings, written agreements, proposals, or other communications between Johnson Controls Inc. and the City of New Brighton. Any change or modification to this Agreement will not be effective unless made in writing. This written instrument must specifically indicate that it is an amendment, change, or modification to this Agreement.

This document represents the business intent of both parties, and should be executed by the parties who would ultimately be signatory to a final agreement.

City of New Brighton		**Johnson Controls, Inc.**	
By:	_____	By:	_____
Signature:	_____	Signature:	_____
Title:	_____	Title:	_____
Date:	_____	Date:	_____

PROJECT DEVELOPMENT AGREEMENT

May 13, 2014
Kathleen Donovan – Account Executive
Jared Mohr – Development Engineer, P.E.

Agenda

- City of New Brighton and Johnson Controls – Our History
- Performance Contracting – Building's included in the Analysis, Facility Improvement Measures, and Program Impact
- Project Development Agreement
- Benefits and Funding
- Questions & Discussion

City of New Brighton & Johnson Controls

- Initial meeting in May 2007
- Preliminary Findings were provided to the City of New Brighton in November 2007 - Economic Conditions put the Project on hold
- Discussions resumed about a potential project in October 2012
- Johnson Controls did a 2nd Walk-through of the City Buildings in December 2012, and provided Preliminary Findings in March 2013
- Johnson Controls met with the City Council in July 2013 to discuss the Next Step in the process: Project Development Agreement
- May 2014 - Johnson Controls requests the approval of the City Council to allow us to validate the Facility Improvement Measures in order to better **quantify and qualify the financial impact of the identified FIM's**

Buildings included the Project Analysis

- City Hall
- Public Works Building & Street Lighting
- Community Center
- Maintenance Facility

Potential Facility Improvement Measures (FIMS)

Facility Improvement Measure		City Hall	Public Safety	Comm. Center	Maint. Facility	Misc
Install Ultra-high Efficient Boilers	X	X	X	X		
Water Heater Improvements	X	X	X			
Air Handler/Rooftop Replacement/Modifications		X	X	X	X	
Electric Motor Upgrades		X	X	X	X	
Re/Retro-Commissioning of Existing Mechanical Systems	X	X	X	X	X	
Extend Building Automation Systems for Enhanced Control & Scheduling	X	X	X	X	X	
Exterior Lighting Upgrades	X	X	X	X	X	
Interior Lighting Upgrades (Lamps & Occupancy Controls)	X	X	X	X		
Install Water Conserving Devices (Sinks & Flush Valves)	X	X	X	X		
Building Envelope Improvements		X	X	X	X	
Street Light Retrofits to LED Technology						X
Generator Installation		X				
Solar Domestic Hot Water Heating				X		
Vending Machine Controls			X	X	X	

X – FIM's that tend to have a Higher Impact

Program Impact

JCI Estimates An 18% Reduction In Annual Energy Spend

$43,890 Reduced annual utility costs

+

JCI Estimates Reductions in Operational Spend

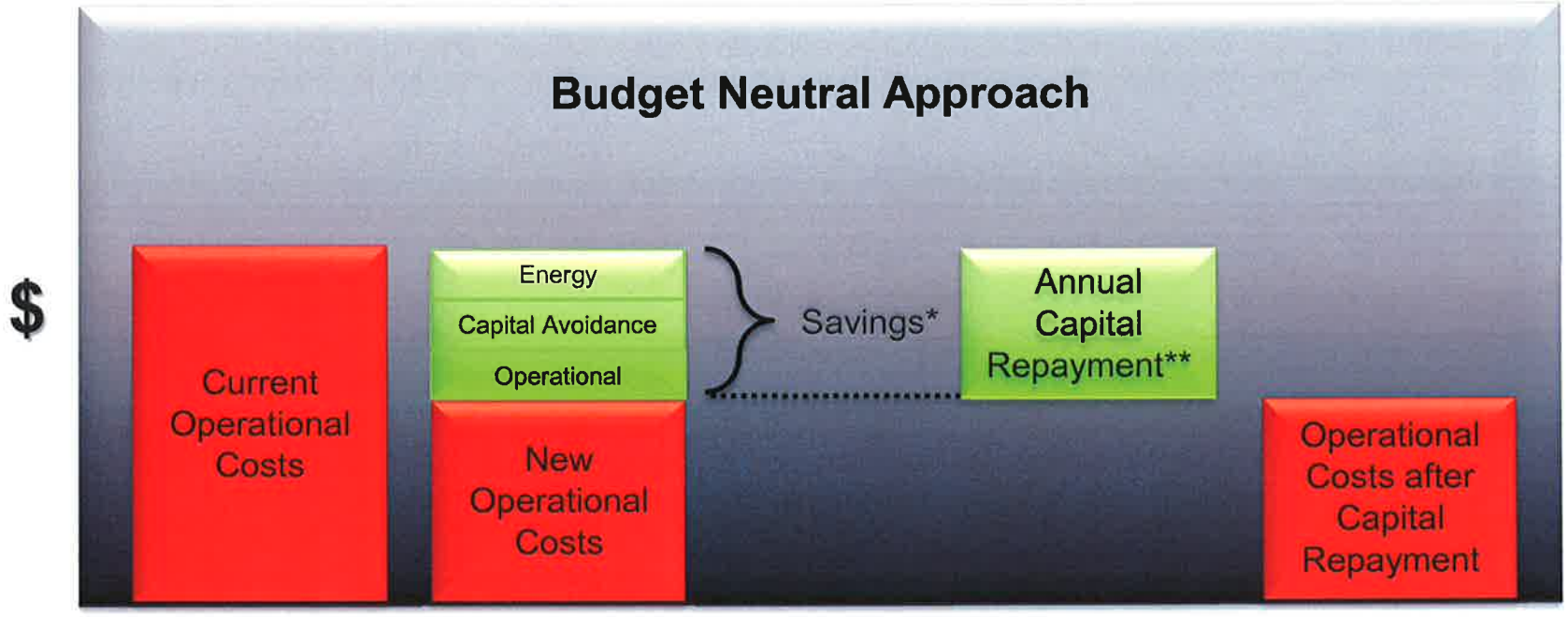
$20,000 Operational cost savings/yr

$63,890* savings x 20 year term
≈ $1,180,000 project

***Does not include any potential Capital Contributions**

Performance Contracting

Performance Contracting uses energy, operational savings and avoided capital expenditures to fund repayment of capital for building/infrastructure needs.



*Excess savings are retained by the client. Shortfall in energy savings made up by Johnson Controls.
** Performance Guarantee ensures that savings will at least be sufficient to repay capital for term.

Project Development Agreement

Comprehensive Building Analysis –

Johnson Controls will commission a **detailed engineering and financial feasibility study****. City personnel, selected subcontractors and Johnson Controls' engineers will work together as a team to validate preliminary findings, (FIM's) and determine specific improvement costs and savings.

The City of New Brighton agrees to pay to Johnson Controls ***$19,950.00*** within 60 days after the delivery of the list of FIMs, the pro-forma financial analysis and associated report. However, New Brighton will have *NO* obligation to pay this amount if:

- Johnson Controls and New Brighton enter in the "Implementation Contract" within 60 days after the delivery of the Energy Study. Costs for the study will be transferred to the total cost of the Implementation Contract and subject to the payment terms outlined in the Contract.
- Or, the project benefits do not offset the cost of the project with a payback period of 20 years or less. Project benefits shall include, but not be limited to utility cost avoidance, negotiated utility rate reductions, operating and maintenance cost avoidance, capital cost avoidance and utility revenue increases.

**The City will receive for *each* Building in the Preliminary Analysis; an Engineering & Energy Audit on their Building that assists Johnson Controls and the City in determining the Scope of the Project that the City may want to use in order to develop into a Performance Contract.

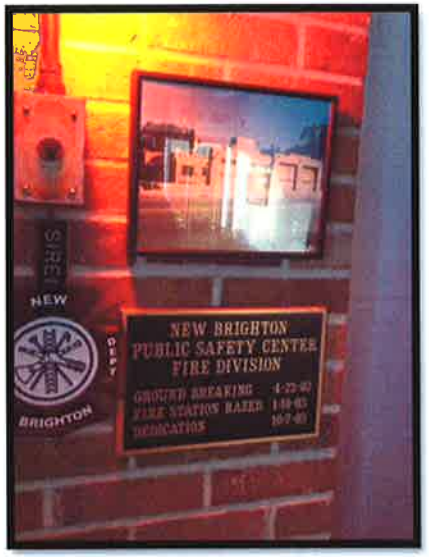
Program Benefits – Performance Contracting

- Enhances community commitments to quality and a high standard of living
  - A self-funding approach to infrastructure renewal that improves operational and financial performance
  - Enables Non-Fleet Capital Funds to be redirected to other projects within the organization
- Low risk: Long term performance and savings are guaranteed
  - If guaranteed savings are *not* met, Johnson Controls will pay for the shortfall
- A collaborative process between the City and Johnson Controls that has a proven track record of financial success for the City
  - This process allows the City to customize the size of the project they are comfortable with, and determine the amount of money they want to spend on the project. Johnson Controls consults with City personnel on the project to help to define the overall scope of the project.
  - Johnson Controls works with local subcontractors when possible to help provide jobs within the community

Funding Opportunities

- Capital Contributions
- Bonding
  - Johnson Controls will work with any Bonding Company that the city prefers
- Rebates
  - Utility **Company's are offering many opportunities for savings on Energy Efficiency Upgrades and** Retrofits
- Grants
  - Johnson Controls has a Grant writing team dedicated to searching for, and writing Grants that may be available to the City

Thank You!



Questions & Discussion

CITY OF ROCHESTER, MINNESOTA
First Class City, First Class Service

Johnson Controls

RECREATION CENTER FACILITY IMPROVEMENT MEASURE (FIM) #1: AHU VFD UPGRADE

EXECUTIVE SUMMARY

This FIM will save electricity at various locations. Prior to the advent of VFD's and when they were still cost prohibitive in most construction projects inlet guide vanes were utilized to implement variable air volume strategies in air units. The vanes varied airflow on the inlet side of the fan based on system static pressure. As VFD's became more affordable they are now commonplace in most variable air systems as well as being retrofitted onto units that originally had inlet guide vanes.

EXISTING CONDITION

AHU 1 and RTU's 5,8,9 & 10 are variable volume units that utilize inlet guide vanes to vary air volume. New VFD's could be installed to vary air volume more efficiently while using less electricity.

1. DETAILED DESCRIPTION OF FIM

The intent of this FIM is to retrofit the existing air units listed with varible speed drives to vary air volume. The scope is as follows.

- Install JCI provided NEMA 4 VFD's on AHU-1, RTU-5, RTU-8, RTU-9 and RTU-10.
- Remove the existing motor controllers, mount the VFD, modify the power wiring and provide all low voltage connections to the BAS for a complete operational system.

VFD horsepower's are as follows:

AHU-1.....10hp @ 480v
RTU-5.....7 1/2hp @ 480v
RTU-8.....10hp @ 480v
RTU-9.....10hp @ 480v
RTU-10.....7 1/2hp @ 480v

- Control System Vendor will be retained on an hourly basis to provide the necessary programming, checkout, and startup services associated with the upgrade. Control Contractor shall quote an hourly rate for modifications to the existing control sequences.

2. First Year Energy Savings Proposed

Proposed energy and cost savings are presented in Tables 1 & 2.

Table 1

	gas	Electricity
	Consumption (MMBTU)	Consumption (kWH)
Baseline	18681	3774200
Post-Installation	18607	3767272
Savings	74	6928

Table 2

	Consumption (MMBTU)	Consumption (kWH)	Total ($/yr)
Baseline	**$153,777**	**$234,344**	**$388,121**
Post-Installation	**$153,168**	**$233,910**	**$387,078**
Savings	**$609**	**$434**	**$1,043**

RECREATION CENTER FIM 2: BUILDING ENVELOPE IMPROVEMENTS

EXECUTIVE SUMMARY

This FIM will improve the building envelope by focusing on air sealing and air barrier systems the building. Although building envelope upgrades lead to energy savings that contribute to a measurable return on investment, other benefits of this service include addressing issues like thermal discomfort, moisture problems and pest infiltration.

Air leakage is defined as the "uncontrolled migration of conditioned air through the building envelope" which is caused by pressure differences due to wind, chimney (or stack) effect, and mechanical systems It has been shown to represent the single largest source of heat loss or gain through the building envelopes of nearly all types of buildings. Tests carried out by the National Research Council of Canada on High Rise Commercial and Residential Buildings, Schools, Supermarkets, and Houses have shown levels of 30 % to 50% of heat loss could be attributed to Air Leakage. Beyond the potential for energy savings, uncontrolled air leakage can affect thermal comfort of occupants, air quality through ingress of contaminants from outside and the imbalance of mechanical systems, and the structural integrity of the building envelope - through moisture migration. Control of air leakage involves the sealing of gaps, cracks and holes, using appropriate materials and systems, to create, if possible, a continuous plane of "air-tightness" to completely encompass the Building Envelope.

EXISTING CONDITION

The building was inspected visually and the staff was interviewed to identify the location and severity of air leakage paths. The existing weather-strip is worn, damaged or ineffective and many of the door stops are damaged or missing.

1. DETAILED DESCRIPTION OF FIM

The existing opening and expansion joints were inspected and additional filling, weatherstripping and sealing will be performed as outlined below.

DOORS

- Air leakage was detected at all the exterior doors throughout the complex. They require weather-stripping. Total 26
- The doors from the warm areas to the cold arena require weather-stripping. Total 34
- Doors leading from the arena to the exterior are also leaky and should be weather-stripped. Total 14

BOILER ROOM

- Some minor penetrations were found in the boiler room and should be sealed and fire stopped.
- Weather-strip the door to the boiler room.

2. First Year Energy Savings Proposed

Proposed energy and cost savings are presented in Tables 1 & 2.

Table 1

	gas
	Consumption (MMBTU)
Baseline	18681
Post-Installation	18416
Savings	265

Table 2

	Consumption (MMBTU)	Total ($/yr)
Baseline	**$153,777**	**$153,777**
Post-Installation	**$151,595**	**$151,595**
Savings	**$2,182**	**$2,182**

RECREATION CENTER FIM 3: NEW DEHUMIDIFICATION UNIT WITH ENERGY RECOVERY

EXECUTIVE SUMMARY

This FIM fill save both gas and electric energy by installing a new dehumidification unit replacing six current rooftop units. The units will be abandoned in place. The unit will heat and cool more efficiently as well as incorporate a heat recovery run around loop strategy to save further energy. This will also reduce O&M costs by reducing the number of units to maintain as well as having a new unit replace units that are near the end of their useful lives.

EXISTING CONDITION

There are currently 6 rooftop units that serve two ice surfaces in the recreation center. These **units are older and at the end of their useful lives and don't bring in enough outside air.**

1. DETAILED DESCRIPTION OF FIM

The intent of this scope is install a new dehumidification unit serving the ice surfaces. The scope is as follows:

- Abandon six rooftop units in place. Disconnect electrical to disable units.
- Install new BRR dehumidification unit. Unit shall be 20,000 CFM with heat recovery. Unit shall be capable of 100% outside air, a preheat coil, DX dehumidification coil.
- Provide additional structural support as necessary to support new unit.
- Provide electrical connections from electrical main. Connection shall be per NEC requirements.

- Tie in to existing Automated Logic control system to allow scheduling and temperature set points.
- Control System Vendor shall provide the necessary programming, checkout, and startup services to modify existing sequences to modulate outdoor air intake based on return air CO2 levels.

2. First Year Energy Savings Proposed

Proposed energy and cost savings are presented in Tables 1 & 2.

Table 1

	Electricity	Steam
	Consumption (kWH)	Consumption (MMBTU)
Baseline	3,774,200	18681
Post-Installation	3694756	18428
Savings	79444	253

Table 2

	Consumption (MMBTU)	Consumption (kWH)	Total ($/yr)
Baseline	**$153,777**	**$234,344**	**$388,121**
Post-Installation	**$151,694**	**$229,408**	**$381,102**
Savings	**$2,083**	**$4,936**	**$7,019**

RECREATION CENTER FIM 4: DEMAND CONTROL

VENTILATION

EXECUTIVE SUMMARY

During the design of building, ventilation air ia a primary concern. Air units are often designed for the maximum capacity. The buildings involved are rarely, if ever loaded to that capacity. In the last five years the idea of demand control ventilation has become more prevalent with advances in sensor technology. Demand control ventilation is implemented in many buildings now adays and is very efficient in commons spaces. It measures the amount of carbon dioxide in the space (seen as the leading contaminant in normal occupancies) and modulates the amount of outside air to maintain an acceptable amount of carbon dioxide in the space (usually around 600 ppm, max allowed is 1000 ppm per ASHRAE Standard 62).

EXISTING CONDITION

A number of air units serve the building. They are sized for a peak outside air load and does not vary during occupied hours. This creates a large amount of outside air that is heated or cooled **that isn't required.**

1. DETAILED DESCRIPTION OF FIM

The intent of this scope is to implement demand control ventilation strategies on units located in the facility that will vary the amount of outside based on the amount of CO2 present in the air and ventilate to maintain a desirable rate. The scope is as follows:

- Install (3) JCI provided CO2 duct mounted sensors in the return air stream of AHU-5, RTU-5 and RTU-12 (New Rink-Tec Unit). Provide low voltage wiring to power and connect the CO2 sensors and tie them into the existing BAS...

- Control System Vendor shall provide the necessary programming, checkout, and startup services to modify existing sequences to modulate outdoor air intake based on return air CO2 levels.

2. First Year Energy Savings Proposed

Proposed energy and cost savings are presented in Tables 1 & 2

Table 1

	Electricity	Steam
	Consumption (kWH)	Consumption (MMBTU)
Baseline	3,774,200	18681
Post-Installation	3722245	2906
Savings	51955	1546

Table 2

	Consumption (MMBTU)	Consumption (kWH)	Total ($/yr)
Baseline	**$153,777**	**$234,344**	**$388,121**
Post-Installation	**$141,050**	**$231,116**	**$372,166**
Savings	**$12,727**	**$3,228**	**$15,955**

RECREATION CENTER FIM 6 : HOCKEY LOCKER ROOM HVAC IMPROVEMENTS

EXECUTIVE SUMMARY

This FIM will bring energy savings by implementing a variable air volume system in a constant air system. There will be a small energy penalty due to the fact that more outside air will be introduced into the area. This will, however greatly improve indoor air quality.

EXISTING CONDITION

AHU-1 serves the current hockey locker room. Currently this unit is not bringing in any outside air and is recirculating air from the locker room. The result is bad indoor air quality and a stuffy smelly area.

1. DETAILED DESCRIPTION OF FIM

The intent of this scope is to install new controls and modify AHU-1 to improve the indoor air quality in the hockey locker room. Controls will be put in place to implement new control strategy. The scope is as follows:

- Provide modifications to the AHU-1 system serving the hockey locker rooms. Details of the system include the addition of (2) variable volume dampers, dampers actuators and related ductwork modifications.

- Install the static pressure sensor provided by JCI. Install all low voltage wiring between the static pressure sensor and damper actuators and the BAS.

- Electrical Contractor shall furnish new dual sensor occupancy sensors for the four (4) locker rooms. Occupancy sensors shall control both lights and volume damper for locker spaces.

- Control System Vendor shall provide programming, checkout, and startup services to sequence operation of AHU-1 based on duct static pressure, area temperatures, occupancy sensors, and owner defined scheduling.

2. First Year Energy Savings Proposed

Proposed energy and cost savings are presented in Tables 1 & 2

Table 1

	Gas	Electricity
	Consumption (MMBTU	Consumption (kWH)
Baseline	18681	3774200
Post-Installation	18744	26930
Savings	-63	59815

Table 2

	Consumption (MMBTU)	Consumption (kWH)	Total ($/yr)
Baseline	**$153,777**	**$234,344**	**$388,121**
Post-Installation	**$154,296**	**$230,630**	**$384,926**
Savings	**-$519**	**$3,714**	**3,195**

ROCHESTER RECEATION CENTER FIM 7: BUILDING HEATING PLANT CONVERSION FROM STEAM TO HOT WATER

EXECUTIVE SUMMARY

This FIM will improve the building efficiency of the centeral heating plant. The current heating plant cantains two 199 HP steam boilers. One boiler is original to the building, and the second was added several years later. Both boilers are in dis repair and are close to failure. The boiler system is fully redundant.

The new system will include two duel fuel hot water boilers. All steam will be removed from the system and be converted to hot water system.

EXISTING CONDITION

The steam plant conversts most of the steam energy into hot water. This hot water serves most of the air handlers and will remain in place.

The following areas will be converted from steam to hot water for better control and usage. Currently the pool heater is steam that will be converted to hot water. This unit will still be sized for the pool to be filled.

In addition, the domestic hot water and two air handlers will be converted to hot water heat. The domestic water will be 100% redundant.

The current pumps will be reused, and speed drives will be added to the system. These will be controled off differenctal pressure. New pumps will be added for the pool system and domestic water. This was done so they can be run independent of the large air handlers.

1. DETAILED DESCRIPTION of FIM

The existing boilers shall be removed and new hot water boilers are to be installed for hydronic heating.

BOILER SYSTEM

- New Boilers shall be hot water boilers with the ability to use natural gas or fuel oil.
- Boilers are to be fully condensing boilers with dedicated outdoor air and exhaust piping for each boiler.
- Existing system pumps are to be reused with the addition of variable speed drive to control off differential pressure.

POOL

- Existing steam heat exchanger will be removed and new plate to plate heat exchanger will be installed.
- Dedicated hydronic pumps will be installed.
- Pool heat exchanger shall be sized for the fill heating demand as it currently is.

DOMESTIC WATER

- Removal of the two steam domestic water heat exchanger and install with two new plate to plate heat exchanger.
- System will be 100% redundant and reuse the existing recirculation pump.
- New hydronic pumps shall be dedicated for the heat exchangers.

2. First Year Energy Savings Proposed

Proposed energy and cost savings are presented in Tables 1 & 2

Table 1

	Steam
	Consumption (MMBTU)
Baseline	18.681
Post-Installation	14,213
Savings	4,467

Table 2

	Consumption (MMBTU)	Total ($/yr)
Baseline	**$153,777**	**$153,777**
Post-Installation	**$117,005**	**$117,005**
Savings	**$36,773**	**$36,773**

Detailed Energy Analysis:

Calculation of energy and cost savings are based on accepted engineering principles. Reference separate package for the energy calculations and formulas. Savings were calculated using a Microsoft Excel based spreadsheet. Calculations were submitted to RPU for review under a separate package.

RECREATION CENTER FIM 8: THERMAL EQUALIZERS IN GYM

EXECUTIVE SUMMARY

This FIM will improve the building efficiency by focusing on eliminating air stratification in the areas listed below. First, it is important to understand the natural phenomena of "temperature gradients." Temperature gradients, or levels, occur when there is minimal air movement within an enclosed building space. The hot air generated by a building's heating system steadily rises to the ceiling. The same holds true for the warm air created during the day by the sun striking a building's roof and southerly facing outer walls. Conversely, cold air sinks to the floor. The net effect is that the ambient temperature at ceiling level is substantially higher than the temperature at floor level.

EXISTING CONDITION

The areas listed below are perfect areas where air stratification occurs. The rooms are very large with high ceilings. According to the staff, the walls and roof have marginal insulating values at best.

1. DETAILED DESCRIPTION OF FIM

Destratification fans will be installed in selected areas. See below for a complete list of rooms covered in under this FIM. Units will be equally spaced throughout the space per manufacturer's recommendations. The units will operate pending the outdoor air temperature. When the outdoor air temperature drops below 50 deg. F the units will receive a signal through the lighting control system to start. Units will operate continuously as long as the outdoor air stays below 50 deg. F.

The scope of work for this FIM includes materials and labor for the following:

- Installation of 55 destratification units
- Necessary control wiring and programming so units operate when the outdoor air temperature drops below 50 deg. F
- Required electrical work.

2. Location Affected

This FIM will affect the following areas:

- Gymnasium: six (6) units

3. First Year Energy Savings Proposed

Proposed energy and cost savings for are presented in Tables 1 & 2

Table 1

	Steam	Electricity	
	Consumption (MMBTU)	Demand KW	Consumption (kWh)
Baseline	18681	0	0
Post-Installation	18595	0	1032
Savings	86	0	-1032

Table 2

	Consumption (MMBTU)	Demand (kW)	Consumption (kWh)	Total ($/yr)
Baseline	**$153,777**	**0**	**0**	**NA**
Post-Installation	**$153,069**	**0**	**$64**	**NA**
Savings	**$708**	**0**	**-$64**	**$644**

RECREATION CENTER FIM 9: NEW WATER SOFTENER SYSTEM

EXECUTIVE SUMMARY

This FIM will save operations and maintenance dollars, though no energy dollars. The intent is to replace an old water softener with a new softener that will operate on substantially less salt **than the current model. In addition, the existing unit is at the end of it's useful life.**

EXISTING CONDITION

A two tank water softener system is currently installed in the boiler room of the above referenced building. It provides conditioning to building heating makeup water. The system is old and inefficient.

1. DETAILED DESCRIPTION OF FIM

The intent of this scope is to install a new water softener system. The scope is as follows:

- Remove the existing twin tank water softener system currently installed in its entirety. Proposal shall included proper disposal of all system components

- Assemble the JCI provided components of the Wigen #CFX10-200M twin water softener system. Unit will be supplied with all major system components including tanks, valves, media and controllers. Supply all necessary pipe, fittings and miscellaneous materials for a complete and operational system. Unit will be installed in the same location as the existing softener equipment.

- Mount and wire the water softener controller. Install all necessary control wiring and provide a 120 volt, 20 amp connection to the unit controller.

- Programming, checkout, startup and owner training services will be provided by the equipment vendor.

6. First Year Energy Savings Proposed

No energy savings are anticipated with this FIM.

RECREATION CENTER FIM 10: DOMESTIC WATER SYSTEM OPTIMIZATION

EXECUTIVE SUMMARY

This FIM will reduce water consumption, wastewater production, and energy usage required for water heating and pumping through the installation of highly efficient control and water conservation technologies.

EXISTING CONDITION

Many of the airport domestic water devices are not operating efficiently. Urinals, toilets and sinks are using more water than necessary. This is due older valves that have gotten out of calibration due to years of use and faucets that are discharging more water than is necessary.

1. DETAILED DESCRIPTION OF FIM

This FIM will impact the domestic water use at the Recreation Center, as well as its water-related energy costs. During the survey, a simple water balance was constructed. The water balance compared the estimated amount of water used in individual equipment operations to the actual metered water usage. This water balance demonstrates that the water-using equipment and systems identified represent the majority of water usage at the facilities.

Saving water goes beyond water conservation. In order to achieve the greatest impact on water usage it will be necessary to install more efficient water fixtures. This approach produces not only water savings, but also energy savings associated with the pumping and heating of water. The recommended domestic system retrofit measures include the following benefits:

- **New Valves:** New valves are aesthetically pleasing, given the new design and chrome finishes involved. Beyond that, new brass valves are free from the mineral deposits that negatively affect valve operation.
- **Elimination of a Variety of Inventory:** By having only one valve throughout your facility, you may eliminate the variety of replacement components you may now maintain in inventory. The ability to stock parts for only one valve type saves you money.
- **Familiarity with One Valve Type:** Because the staff need only be familiar with one valve type, they can often minimize the time associated with work order requests.
- **Installation of Vandal Resistant Flow Controls on faucets:** This will regulate flow and keep the faucets from being tampered with.

1.1 Inclusions

The following is a list of water-using and energy-using equipment that has been targeted during the detailed audit, as well as the location that is being affected.

Table 1.2: Opportunities by Equipment Type

Equipment	Location	Qty
Flushometer Retrofit	Rest Rooms	0
Flushometer X body Upgrade	Rest Rooms	50
Faucet Aerators	Rest Rooms	28
Spud and Flush tube	Rest Rooms	50

2. First Year Energy Savings

The annual energy savings and cost savings are presented in Tables 1 and 2.

Table 1

	Consumption (MMBTU)	Consumption (kgal)
Baseline	18681	6159
Post-Installation	18330	5227
Savings	351	932

Table 2

	Consumption (MMBTU)	Consumption (kgal)	Total ($/yr)
Baseline	**$153,777**	**$17,145**	**$170,922**
Post-Installation	**$150,888**	**$15,433**	**$166,321**
Savings	**$2,889**	**$1,712**	**$4,601**

Dollar Savings Estimate

Dollar savings is determined by multiplying the current water and sewer rate times the difference between baseline usage and proposed usage.

Calculation of energy and cost savings are based on accepted engineering principles. Reference separate package for the energy calculations and formulas. Savings were calculated using a Microsoft Excel based spreadsheet. Calculations were submitted to RPU for review under a separate package.

RECREATION CENTER LIGHTING IMPROVEMENT FIM

EXECUTIVE SUMMARY

This FIM will include replacing 1000 watt and 400 watt metal halide lighting serving the ice rinks, pool area, and gymnasium spaces with new multi-lamp T-5 HO fluorescent fixtures, replacing 175-watt metal halide fixtures over the bleachers with multi-lamp T-8 fluorescent fixtures and installing Vending Miser controllers on the pop machines. This FIM will dramatically improve lighting quality and reduce lighting system maintenance costs for the affected areas of the Recreation Center.

EXISTING CONDITION

The fluorescent fixtures in the facility are currently utilizing T-8 lamp technology. In addition occupancy sensors are utilized through out the facility as well. The facility currently utilizes 1000 watt and 400 watt metal halide fixtures for the ice rinks, pool, and gymnasium areas. Exterior area lighting was not addressed at the request of the City. This FIM will include: Replacing the 1000 watt and 400 watt metal halide fixtures with new Paragon Rinkmaster multi-lamp T-5 HO fluorescent fixtures and modifying the current circuitry to allow for multi-level switching: Replacing 175 watt metal halide fixtures with multi-lamp T-8 fluorescent fixtures: Installing Vending Miser controllers on the pop machines.

1. DETAILED DESCRIPTION OF FIM

The scope of work for the lighting retrofit includes:

- Replacing (28) 1000 watt metal halide fixtures with (28) Paragon Rinkmaster 10 lamp T-5 HO fixtures in the pool area.
- Replacing (8) 400 watt metal halide fixtures with (8) Paragon Rinkmaster 6 lamp T-5 HO fixtures in the pool area.
- Replacing (32) 1000 watt metal halide fixtures with (32) Paragon Rinkmaster 10 lamp T-5 HO fixtures over the ice rinks. Circuitry will be modified to allow for multi-level switching of the fixtures.
- Replacing (28) 175 watt metal halide fixtures with (28) multi-lamp T-8 fluorescent fixtures.
- Installing 3 Vending Miser controllers on the pop machines.

2. First Year Energy Savings Proposed

The new T-5 fluorescent lamps and T-8 fluorescent lamps require up to 50% less electricity than the units they are replacing resulting in a reduction in energy consumption. The Vending Miser controllers result in a cost savings of up to $100.00 annually per vending machine. The quality of the lighting will be dramatically increased in the affected areas and the life expectancy and lumen depreciation of the new lamping systems is better than that of the units being replaced resulting in a reduction in O&M costs.

Proposed energy and cost savings are presented in Table 1 below:

Table 1

	Electrical Consumption (kW Connected)	KWh / Yr Saved	$ / Yr Saved
Base Line	130.45		
Post-Installation	62.55	382,441	
Savings	67.91	382,441	$29,257.92

Detailed Energy Analysis:

Calculations of energy usage and cost savings are based on accepted engineering principles. Lighting savings are a summation of lighting fixture kW demand reduction and lighting fixture kWh consumption reduction. Costs calculations utilize a blended electric rate, which is established from RPU's 2005 rate structure.

A room-by-room lighting survey was conducted for the Recreation Center. Savings were calculated using a Microsoft Excel based spreadsheet. Existing and proposed lighting system descriptions, operating schedules, and utility rate structures were input into the spreadsheet. Annual energy savings and installation specific data were summarized in the program output. Program input and output data has been updated and provided as part of the Detailed Energy Survey.

The lighting upgrade will affect the heating and cooling requirements within the facilities. However to simplify the Measurement and Verification protocol for this FIM and to maintain a conservative approach to savings calculations, these synergistic effects of the lighting upgrade were ignored. Additional benefits such as improved lighting quality and improvements to the environment (due to lower greenhouse gas emissions) will occur as well.

Sample Formulas:

Fixture Watts = Number of Fixtures x Watts

kWh per Year Existing = (Existing Fixture Watts/ 1000) x (Annual Operating Hours)

kWh per Year Proposed = (Proposed Fixture Watts/ 1000) x (Annual Operating Hours)

kWh Savings = (kWh per Month Lights Existing) – (kWh per Month Lights Proposed)

Electricity Energy Cost Existing = (Annual kWh Existing) x (Energy Cost Rate)

Electricity Energy Cost Proposed = (Annual kWh Proposed) x (Energy Cost Rate)

Electricity Energy Cost Savings = (Electricity Energy Cost Existing) – (Electricity Energy Cost Proposed).

Operating Assumptions:

- Typical ANSI fixture wattage data was used to compute savings.
- Values for operational hours were discussed with on-site personnel.
- A blended electrical rate based on RPU's 2005 electric rate structure was used for the savings calculations.
- Disposal of all lamps will be will be completed by RPU's Energy Solutions division.
- The new lamps and sensors will be covered by the full manufacturer's warranty. Details of the warranty will be provided with the material cut sheets.

RECREATION CENTER FIM 12: BAS SYSTEM UPGRADE

EXECUTIVE SUMMARY

The majority of energy usage at the Recreation Center comes from the operation of motors and the heating/cooling of outside air associated with air-handling systems. With the rising cost of fuel, the operation of the lighting and air-handling systems must be closely watched and fine-tuned to limit wasted energy.

EXISTING CONDITION

There is an existing DDC control system in place but the system is not a web based system as is becoming the norm in the BAS industry.

1. Detailed Description of the FIM

The existing DDC control system will be upgraded so the system can be accessed via the world wide web rather than relying on a central head end computer and dial up access.

2. First Year Energy Savings Proposed

No savings are anticipated in this FIM

RECREATION CENTER FIM 14: NEW ROAD SIDE SIGN

EXECUTIVE SUMMARY

The Owner has a need for an upgrade to the existing roadside sign at the above listed facility. This will incorporate an LED sign on it that will allow messages to be displayed and read from passing cars.

EXISTING CONDITION

Currently, an older outdated sign is installed at the facility.

1. Detailed Description of the FIM

The intent of this scope is to install a new video screen in the facility listed above. The scope is as follows:

- Install new roadside sign in existing sign location. New sign shall be by Dectronics.
- Route new electric service from nearest available power panel. Route and install per most recent NEC requirements.
- Route communications cabling as required to control new sign.
- Provide checkout and training for Owner.

2. First Year Energy Savings Proposed

No savings are anticipated in this FIM