The Energy Savings and Emission Reduction Benefits Delivered by Johnson Controls and Its Customers In the State of Wisconsin

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A Cleaner and Greener[SM] Environment Program Report by Leonardo Academy Inc.

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Executive Summary

This report assessed the economic, environmental, public health, and other quality-of-life impacts from 100 Energy Performance Projects, implemented by Johnson Controls, Inc. (JCI), in the State of Wisconsin. The analysis shows that these energy efficiency projects provide major short term and long term environmental, energy supply and financial benefits. Many of these energy efficiency projects were also part of the Wisconsin Energy Initiative (WEI). WEI involves comprehensive audits and upgrades to 6,800 State of Wisconsin buildings at 34 major facilities.

The analysis indicates that as a result of energy efficiency projects implemented since 1992, Johnson Controls has already made a major contribution to saving energy and reducing a wide range of types of emissions in Wisconsin. The actual carbon dioxide emission reductions from these projects have already reached 1.5 million tons and have produced $46.3 million in total energy savings.

Wisconsin energy performance contracts implemented through 2004 will continue to produce energy and emission savings over the next 10 to 25 years. These projects are expected to produce over $194 million in total energy savings and significantly reduce air emissions in Wisconsin. Emission reductions include carbon dioxide emissions by 11.1 million tons, nitrogen oxide emissions by 25,000 tons and sulfur dioxide emissions by 76,000 tons. These projects will also result in over 5.5 billion gallons of water savings. The study also indicates tremendous benefits to public health for Wisconsin residents as a result of the reduced emissions.

Background

The international debate about the potential impacts of global climate change is increasingly moving beyond science into the economics of emission reduction strategies and the policies that are needed to best mitigate potential impacts. Both the 1997 Kyoto accords and the 1992 Rio Earth Summit promoted international efforts to reduce greenhouse gas (GHG) emissions. The U.S. chose not to ratify the Kyoto Protocol, but under the Agreement, the U.S. would have been required to limit greenhouse gas emissions to 7 percent below 1990 levels on average between the years 2008 - 2012. Most climate change experts agree that significant actions are necessary to achieve this goal since total U.S. GHG emissions continue to rise. In 1999, carbon dioxide emissions were 11.7% above the 1990 emission level of 1,349 million metric tons and projected by 2010 and 2020 to reach levels 34 % and 51 % higher, respectively, than 1990.[1]

While ultimately an international issue, state government agencies and private companies are increasingly active in climate change discussions. The key reason is that the federal government is seeking to limit “command and control” measures and encourage marketplace leadership as a way of implementing initiatives to reduce GHG and other emissions. Energy Service Companies (ESCOs) play an active role in researching, developing and implementing mitigation strategies to reduce GHG and other emissions. This report shows the important contribution energy efficiency improvements and performance contracting can make towards reducing all types of emissions in Wisconsin.

Findings

Johnson Controls’ efforts to make buildings more useful, productive and energy efficient have resulted in substantial energy and cost savings for their Wisconsin customers. These efforts have also produced added environmental and health benefits from the resulting pollution reductions.

The benefits to date (1992-2003) from JCI Wisconsin efficiency projects include:

- Energy cost savings of $46.3 million
- Electric energy savings of 751,685 MWh (enough to power over 87,000 Wisconsin households for one year)[7]
- Reduced carbon dioxide emissions of 1.5 million tons (equivalent to planting 4.6 million trees or offsetting the annual emissions of over 304,000 mid-sized automobiles for one year) [4]

The cumulative benefits from JCI Wisconsin efficiency projects through their useful lives (1992-2026) include:

- Energy cost savings of $194.6 million
- Electric energy savings of 2.2 million MWh (enough to power over 260,000 Wisconsin households for one year)[7]
- Electric demand reductions equal to 28 MW
- Reduced carbon dioxide emissions of 11.1 million tons (equivalent to planting 33 million trees or offsetting the annual emissions of 2.2 million mid-sized automobiles for one year) [4]

Reducing emissions positively impacts the general health of the public. Environmental emissions cause significant health problems among children, the elderly and people with compromised immune systems. Air pollution has also been linked to increased incidence of asthma in children. Cutting energy consumption reduces the emissions that heighten these health problems.

Reducing the demand for electricity increases the reliability of the power supply in Wisconsin. In addition, investments in cost-effective energy efficiency measures have been shown to deliver local employment and income benefits. Businesses in Wisconsin are able to spend less on imported fuels and electricity and this lowers their cost of delivering products and services to Wisconsin residents and businesses. This results in increased competitiveness, productivity, and profitability for Wisconsin businesses.

Project Participants

Stephen L. Olson is Director of Finance and Operations for Leonardo Academy Inc. **Michael Arny** is President and Executive Director for Leonardo Academy Inc.

Leonardo Academy, Inc. is an independent non-profit organization, which runs the national *Cleaner and Greener Environment Program.* Leonardo Academy is funded by grants from foundations, government contracts and private donations. Leonardo Academy provides independent analysis and recognition for companies and their customers who implement energy efficiency improvements. Leonardo Academy helps businesses and organizations equate energy savings to equivalent emission reductions in an effort to promote the development of markets and financial rewards for the emission reductions that result from energy efficiency and other emission reduction actions. For more information about Leonardo Academy or the *Cleaner and Greener Environment Program* visit their website at *www.cleanerandgreener.org*.

Johnson Controls is a Fortune 150 company that develops and implements cost-effective strategies to make buildings more useful, productive and energy efficient. Performance contracting is a funding mechanism that pays for these strategies through the energy savings realized by the plan. Close measurement and verification of energy use is key to determining savings, thus the company's figures are very reliable.

The company's primary customers include K-12 schools, commercial and industrial buildings, retail chain stores, and local and federal government buildings. This study provides an independent assessment of the energy, environmental, economic, and public health benefits Johnson Controls delivers through its business practices in Wisconsin.

Project Overview

Introduction

Johnson Controls is a leading provider of energy management systems and services. It has also taken a leadership position in building green. For example, the company's corporate headquarters, the Brengel Technology Center, was recognized by the U.S. Green Building Council as a model of green building design when it was completed in 2000.

Johnson Controls' efforts to make buildings more useful, productive and energy efficient have produced substantial energy use savings. Since 1990, the company's customers have realized these savings as a result of implementing improvement projects designed to optimize their buildings for energy efficiency. Johnson Controls has lowered its own facilities operating costs, too.

This study reports the energy savings impacts of many different types of Johnson Controls energy efficiency projects in Wisconsin and also includes projects implemented as part of the Wisconsin Energy Initiative. The improvement projects contribute to reductions in energy use, demand for electricity, direct fuel use and environmental emissions. Benefits are measured and recognized on three levels:

(1) As savings on direct energy costs, realized by individual companies
(2) As reduced demand for both total energy and load capacity, realized by utilities or other energy providers
(3) As reduced environmental emissions, the result of reductions in demand for generated power

The methodology and project data used for calculating the emission reduction benefits delivered by these projects are discussed in Appendix A. While a majority of a project's dollar investments are made upfront, the energy savings resulting from these investments continue to accrue for many years. Cost savings continue well beyond the project's payback period and are the result of yearly electricity and fuel savings. Actual contract lengths from 10 to 25 years were used to determine realized and projected savings on projects implemented from 1992 though 2004. Contracts implemented in this study include projected savings through 2026.

Do Energy Efficiency Projects Make a Difference

Johnson Controls offers a number of services to help building owners and facilities managers develop energy efficiency goals and action plans. The company works with customers to develop and implement cost-effective projects that upgrade buildings and increase their energy efficiency. For more than 10 years, the company has been a leader in helping industries throughout North America boost their bottom lines by using energy more efficiently.

According to the U.S. Department of Energy (DOE) and industry experts, nearly every company can identify opportunities to further improve energy efficiency. And the impact of energy savings projects goes beyond an individual firm's bottom line.

By saving energy and improving the bottom line, companies are also helping the environment.

The value of environmental stewardship

As a by-product of energy production, power plants produce emissions harmful to individuals and the environment. Electricity reductions not only save money for customers but also result in substantial

emission reductions, which leads to environmental and health benefits from the resulting pollution reductions.

Reducing harmful greenhouse gas emissions is an international goal. Most participants in the 1997 Kyoto conference on International Climate Control committed themselves to reducing their combined annual greenhouse-gas emissions over the next decade to five percent below 1990 levels. Energy efficiency measures are a key component of a strategic approach to limit greenhouse gas emissions related to energy use.

Leonardo Academy is dedicated to raising awareness about the need to reduce all types of emissions including greenhouse gas emissions. A primary goal of the organization is to develop and provide better information on energy use and market trends. Since 1998, Leonardo Academy has been helping Johnson Controls and its customers track their participation in energy efficiency programs in order to benchmark how they make their operations more efficient, lower their energy costs and significantly reduce their demand for energy. By equating their energy savings directly into a reduction in emissions, it has helped Johnson Controls and its customers realize the value their energy-savings investments provide for the environment.

This report, published in November 2003, details Johnson Controls and its Wisconsin customers' efforts to make energy efficiency investments throughout their operations in order to lower their own energy costs. Realized reductions in energy demand are converted into equivalent reductions in emissions. As of now, except for efforts in a few eastern-U.S. states, companies making investments to improve the energy efficiency of their operations receive no monetary benefit for reducing emissions. But the type of analysis in this report shows that the energy savings are real and quantifiable. Understanding the significance and value of reduced emissions is a first step in the process of lobbying regulatory authorities to give private companies emission reduction credits, which could eventually be used to benefit the environment or to offset investment in new energy efficiency technologies and services.

Project Results

Summary of Impacts of Johnson Controls Energy Efficiency Projects on Energy Savings and Emission Reductions in Wisconsin

Johnson Controls (JCI) makes a major contribution to reductions in electric energy use, demand for electricity, direct fuel use and environmental emissions in the State of Wisconsin. JCI makes these contributions by working with customers to develop and implement cost-effective projects that upgrade buildings and increase their energy efficiency.

Part 1 - The Benefits to Date from 100 Johnson Controls Energy Efficiency Projects in the State of Wisconsin

This study measured the energy savings and environmental impacts of 100 energy efficiency projects implemented by Johnson Controls in Wisconsin. Johnson Controls efforts to make buildings more useful, productive and energy efficient have already produced substantial energy use savings in the State of Wisconsin. These energy savings have contributed a great deal towards reducing energy costs for state businesses. The electricity and fuel reductions not only save money for customers but also result in substantial emission and pollution reductions and environmental and health benefits.

Energy and Water Savings

The study indicates that as a result of energy efficiency projects implemented from 1992 through 2002, Johnson Controls has already made a major contribution to saving energy and reducing a wide range of types of emissions. The Wisconsin energy efficiency projects have produced guaranteed energy cost savings of $46.3 million, water savings of 323 million gallons, and electric energy savings of 752,000 MWh, enough electric energy savings to power over 87,000 Wisconsin households for one year (Table 1).[7]

Table 1. Energy and Water Savings to Date of 100 JCI Wisconsin Energy Efficiency Projects

Savings Category	Project Impacts to Date
Energy Savings (Million $)	$46.3
Electricity Savings (MWh)	751,685
Reduction in Direct Natural Gas Use (therms)	5,840,400
Reduction in Steam Use (Mlbs)	6,086,119
Reduction in Water Use (Million Gallons)	323

Emission Reductions

The emission reduction estimates, which were developed using standard industry calculations and emission factors, show that the Johnson Controls energy efficient projects have already resulted in large emission reductions. Energy efficiency measures also have an added benefit in that the individual efficiency actions reduce multiple pollutants.

The study indicates that, to date, energy efficiency projects implemented by the 100 JCl Wisconsin energy efficient projects have reduced U.S. carbon dioxide emissions by over 1.5 million tons (Table 2). NOx and SO_2 emissions also were reduced by roughly 3,300 and 8,400 tons respectively.

Table 2. Emission Reduction Impacts to Date from JCI Wisconsin Efficiency Projects

Emission Type	Project Impacts to Date
Carbon Dioxides (CO_2) - Short Tons	1,549,070
Nitrogen Oxides (NOx) - Short Tons	3,344
Sulfur Dioxides (SO_2) - Short Tons	8,382
Particulates (PM10) - Short Tons	371
Mercury (Hg) – lbs.	543

***Environmental Benefits*[4]**

Energy and emissions savings from the JCI energy efficiency projects to date have also produced significant benefits for the environment. The reduction of energy and emissions provided environmental benefits equivalent to:

- Offsetting the effects of 305,000 mid-sized automobiles from the environment for one year
- Planting over 4.6 million trees

Part 2 - The Cumulative Benefits from 100 Johnson Controls Energy Efficiency Projects in the State of Wisconsin

Johnson Controls' efforts to make buildings more useful, productive and energy efficient produce substantial energy use savings in the State of Wisconsin. This contributes a great deal towards reducing energy costs for state businesses. While a majority of the project dollar investments are made upfront, the energy savings resulting from these investments continue to accumulate over many years. These energy savings continue well beyond the project's payback period and are the result of yearly electricity and fuel savings. The electricity and fuel reductions not only save money for customers but also result in substantial emission and pollution reductions and environmental and health benefits.

Energy and Demand Savings

Johnson Controls' Wisconsin performance contracts implemented through 2004 will continue to produce energy and emission savings over the next 10 to 25 years. The 100 projects are expected to produce energy cost savings of over $194 million, electric energy savings of 2.2 million MWh (enough electric energy savings to power over 260,000 Wisconsin households for one year) and electric demand reductions equal to 28 MW (Table 3). [7]

Table 3. Energy and Demand Savings from 100 JCI Wisconsin Energy Efficiency Projects

Savings Category	Combined Annual Impacts of All Projects	Cumulative Impacts of Projects
Energy Savings (Million $)	$12.3	$194.6
Electricity Savings (MWh)	147,990	2,231,252
Electric Demand Reduction (MW)	28	N/A
Dollar Value of Demand Reduction (Million $)	$14.1	N/A
Reduction in Direct Natural Gas Use (therms)	2,708,837	41,682,968
Reduction in Steam Use (Mlbs)	3,264,434	77,346,505
Reduction in Water Use (Million Gallons)	376	5,519

Emission Reductions

The emission reduction estimates show that the JCI energy efficient projects result in tremendous emission reductions through the life of the projects. Energy efficiency measures also have an added benefit in that individual efficiency actions reduce multiple pollutants.

The study indicates that Wisconsin energy efficiency projects implemented by JCl are expected to reduce U.S. carbon dioxide emissions by 11.1 million tons (Table 4). NOx and SO_2 emissions also are reduced by roughly 25,000 and 76,000 tons respectively.

Table 4. Emission Reduction Impacts from 100 JCI Wisconsin Efficiency Projects

Emission Type	Combined Annual Impacts of All Projects	Cumulative Impacts of Projects
Carbon Dioxides (CO_2) - Short Tons	532,858	11,070,098
Nitrogen Oxides (NOx) - Short Tons	1,165	24,580
Sulfur Dioxides (SO_2) - Short Tons	3,371	75,837
Particulates (PM10) - Short Tons	160	3,686
Mercury (Hg) – lbs.	278	6,533

Environmental Benefits[4]

The cumulative energy and emissions savings from the JCI energy efficiency projects produce significant environmental benefits equivalent to:

- Offsetting the effects of 2.2 million mid-sized automobiles from the environment for one year
- Planting over 33 million trees

Part 3 - Wisconsin Energy Initiative Projects

In April of 1992, the State of Wisconsin announced the *"Wisconsin Energy Initiative"* (WEI), an ambitious $50 million dollar six-year energy conservation program that would significantly reduce the energy consumption in state facilities and result in cost savings to Wisconsin taxpayers. The WEI involves comprehensive audits and upgrades to the State's 6,800 buildings at 34 major facilities. By developing the WEI, the state is saving energy and taxpayer dollars, increasing employment and protecting the environment. It is the largest, most comprehensive energy efficiency program for state facilities in Wisconsin history.

Johnson Controls was selected as the coordinator of the WEI program. The audits concentrated on 1000 of the largest buildings to identify 20% of the opportunities that would produce 80% of the savings. In April of 1998, the State expanded WEI to include energy conservation opportunities beyond traditional lighting retrofits. Johnson Controls' WEI team has audited over 35 million ft^2 of building space to identify energy efficiencies in heating, ventilating and air conditioning systems, building automation systems, and waterside savings.

Summary of Impacts of Johnson Controls WEI Energy Efficiency Projects on Energy Savings and Emission Reductions in Wisconsin

Many of the previously discussed energy efficiency projects were part of the Wisconsin Energy Initiative. Johnson Controls' involvement with the WEI has already produced substantial energy use savings in

State of Wisconsin buildings. This has contributed a great deal towards reducing energy costs for state facilities. The electricity and fuel reductions not only save money for state customers and taxpayers but also result in substantial emission reductions and environmental and health benefits from the resulting pollution reductions.

Johnson Controls' involvement with the WEI will continue to make state-owned buildings more useful, productive and energy efficient and produce substantial energy use savings in the State of Wisconsin for years to come. This will contribute a great deal towards reducing energy costs for state facilities. This is vital in times of ever-tightening budgets and the current climate of large federal and state budget deficits.

Energy and Demand Savings

The study indicates that as a result of WEI energy efficiency projects implemented through 2002, Johnson Controls has already made a major contribution to saving energy and reducing a wide range of types of emissions. The JCI WEI energy efficiency projects have produced energy cost savings of $39.9 million and electric energy savings of 682,000 MWh (Table 5).

The JCI WEI performance contracts implemented through 2004 will continue to produce energy and emission savings over the next 10 to 25 years. JCI WEI projects are expected to produce total energy cost savings of over $155 million, electric energy savings of 1.9 million MWh (enough electric energy savings to power over 220,000 Wisconsin households for a year) and electric demand reductions equal to 24 MW (Table 4).

Table 5. Energy, Demand, and Water Savings from JCI WEI Energy Efficiency Projects

Savings Category	Cumulative Impacts of Projects	Combined Annual Impacts of All Projects	Project Impacts to Date
Energy Savings (Million $)	$155.2	$9.7	$39.9
Electricity Savings (MWh)	1,883,580	124,885	682,107
Electric Demand Reduction (MW)	N/A	23.8	N/A
Dollar Value of Demand Reduction (Million $)	N/A	$11.9	N/A
Reduction in Direct Natural Gas Use (therms)	14,951,702	991,809	799,275
Reduction in Steam Use (Mlbs)	77,041,720	3,244,115	6,086,119
Reduction in Water Use (Million Gallons)	5,014	342	314

Emission Reductions

The emission reduction estimates, which were developed using standard industry calculations and emission factors, show that JCI WEI energy efficient projects have already resulted in large emission reductions.

The study indicates that, to date, WEI energy efficiency projects implemented by JCl have reduced U.S. carbon dioxide emissions by over 1.4 million tons (Table 6). NOx and SO_2 emissions also were reduced by roughly 3,100 and 8,100 tons respectively.

The emission reduction estimates show that JCI WEI energy efficient projects result in tremendous emission reductions through the life of the efficiency projects. The study indicates that WEI energy efficiency projects implemented by JCl will reduce U.S. carbon dioxide emissions by 10.5 million tons (Table 6). NOx and SO_2 emissions also are reduced by roughly 24,000 and 74,000 tons respectively.

Table 6. Emission Reduction Impacts from JCI WEI Efficiency Projects

Emission Type	Cumulative Impacts of Projects	Combined Annual Impacts of All Projects	Project Impacts to Date
Carbon Dioxides (CO_2) - Short Tons	10,487,957	494,514	1,439,125
Nitrogen Oxides (NOx) - Short Tons	23,501	1,094	3,136
Sulfur Dioxides (SO_2) - Short Tons	74,325	3,271	8,079
Particulates (PM10) - Short Tons	3,632	157	360
Mercury (Hg) – lbs.	6,490	276	540

Environmental Benefits[4]

Cumulative energy and emissions savings from the JCI Wisconsin Energy Initiative energy efficiency projects through the life of the efficiency projects produce significant environmental benefits equivalent to:

- Offsetting the effects of 2.1 million mid-sized automobiles from the environment for one year
- Planting over 31 million trees

Conclusion

Johnson Controls, Inc. and its Wisconsin customers are proof that energy efficient building design and improvements can play a substantial role in lowering overall energy and operations costs and reducing pollution leading to environmental and health benefits.

Reducing emissions positively impacts the general health of Wisconsin. Environmental emissions cause significant health problems among children, the elderly and people with compromised immune systems. Air pollution has also been linked to increased incidence of asthma in children. Cutting energy consumption reduces the emissions that heighten these health problems.

In addition, investments in cost-effective energy efficiency measures have been shown to deliver local employment and income benefits. Johnson Controls and their Wisconsin customers are able to spend less on imported fuels and electricity and this lowers their cost of producing goods and delivering services. This results in increased competitiveness, productivity, and profitability for these businesses.

By working to meet its Wisconsin customers' needs, Johnson Controls makes a major contribution to the local quality of life and reduction of energy use and emissions. Since many of the Wisconsin projects are in State-owned facilities, Wisconsin taxpayers also benefit from the resulting energy savings. Investments in more efficient technology consume less energy yet delivers a similar and often improved level of comfort, light, motion, and power. These projects, encouraged through Johnson Controls' involvement, provide significant contributions to economic development, a cleaner environment, and improved public health.

References

All web site addresses in references valid as of November 17, 2003.

1 U.S. DOE / EIA, Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity, Web Site: http://www.eia.doe.gov/neic/press/kyoto1.gif

2 Emission Factors and Energy Prices for the Cleaner and Greener Environmental Program, Leonardo Academy, Jan. 2003.

3 U.S. DOE / EIA 1605(b) Voluntary Reporting of Greenhouse Gases Appendix G. Adjusted Electricity Emission Factors by State, February, 2002

4 EPA's National Emission Trends (NET) database, October 2001 version, EPA Office of Air and Radiation – AIRDATA

5 American Forests Web Site: http://www.americanforests.org/resources/ccc/; 1 ton CO2 = 3 trees planted, 1 Mid-sized car = 10,168.3 lbs. CO_2 per year (Annual: 509 gallons, 22.2 mpg, 11,300 miles)

6 U.S. EPA E-GRID2002 Version 1.0 Released January 2003. (http://www.epa.gov/cleanenergy/egrid/index.html)

7 U.S. EPA Office of Air Quality Planning & Standards, AP - 42 Emission Factors Supplement Documents, Update 2002

8 U.S. DOE/EIA Table 2a. U.S. Average Monthly Bill by Sector, Census Division and State, 2000 Residential, (http://www.eia.doe.gov/cneaf/electricity/epav2/html_tables/epav2t2p1.html)

9 The Wisconsin Energy Initiative, Ronald P.C. Waller, PMP, CEM, CDSM, Director of Operations (retired), Johnson Controls Government Systems L.L.C.

10 The Wisconsin Energy Initiative, Saving Taxpayers Money By Improving Facility Energy Efficiency, Johnson Controls Case Study.

11 U.S. Green Building Council (USGBC). LEED™ Rating System (www.usgbc.org)

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Appendix A

Methodology for Wisconsin Energy Performance Contracts

The energy savings and emission reduction benefits delivered by the Wisconsin Energy Performance Contract Projects were based on guaranteed annual dollar, electricity and fuel energy savings within each of the 100 individual projects. The Johnson Controls– Appleton, Wisconsin Office provided source project energy and cost data used in the analysis (Tables A1 and A2).

The Analysis was based on the following assumptions:

- The length of Guaranteed Performance Contracts ranged from 10 to 25 years.
- Electric Demand Reduction (kW) from New Investment was calculated using annual electricity savings (kWh per year) divided by the hours in a year. The annual kW savings were divided by a capacity factor of 60% to calculate the kW demand reduction.
- Applicable Wisconsin state average emission factors were applied to the electricity (kWh) to calculate emission reductions.
- U.S. EPA and U.S. DOE standard emission factors were applied to natural gas (therms), and steam (Mlbs) savings to calculate emission reductions. Steam savings were converted to coal or natural gas savings based on the source fuel for the specific project's steam generation.
- Wisconsin average monthly consumption per residential consumer is equal to 713 kWh per month
- The analysis considered four different time frames of project impacts:
    - Project Impacts to Date – equals the sum of the annual energy, economic, and environmental impacts of projects for every year from their implementation date through the end of 2003
    - Average Annual Project Impacts – equals the cumulative energy, economic, and environmental impacts of projects divided by the total number of years in the study period (not shown in the project results section)
    - Combined Annual Impacts of All Projects - the sum of the annual impact for when all of the projects overlap in the same year (the year 2005 was used for this analysis)
    - Cumulative Impacts of Projects - equals the sum of all of the project's cumulative energy, economic, and environmental impacts over their contract period (10 to 25 years in length)

Johnson Controls Individual Project Data

Table A1. Installation Date By JCI Energy Performance Contracting Project

Name of Project	Project Installation Date (completed)	Name of Project	Project Installation Date (completed)
Lake Superior State University	Sep-02	WEI UW Fox Valley	Mar-03
Brown Deer Schools	Jun-04	WEI UW Sheboygan	Jun-02
Aurora Hartford Hospital	Dec-03	WEI UW-Rock	Nov-01
Aurora Heil Facility	Nov-03	WEI UW-Parkside	Jun-99
Aurora Kenosha Hospital	Nov-03	WEI UW-Milwaukee 1	Jan-01
Cedarburg School District	Sep-94	WEI UW-Milwaukee II	Jun-01
Port Washington School District	Nov-94	WEI UW-Milwaukee III	Sep-01
Cudahy School District	Nov-96	WEI UW-Milwaukee IV	Sep-01
Marquette University	Dec-03	WEI UW-Whitewater	Feb-03
Columbia Health Care Center	Sep-03	WEI UW Washington County	Sep-02
Nicolet High School	Apr-97	WEI UW Waukesha	Mar-01
Germantown School District	Jan-03	WEI King VA	Sep-02
Grafton School District	Apr-97	WEI Winnebago Mental Health	Mar-00
UW Marinette	Jun-99	WEI Mendota Mental Health	Oct-01
Wittenburg School District	Oct-94	WEI Southern Wisconsin Center	Dec-02
Hayward School District	Jul-93	WEI Green Bay Correctional	Sep-01
Elmbrook Memorial Hospital	Oct-97	WEI Kettle Moraine Correctional	Mar-03
Sun Prairie Schools	Oct-94	WEI Oshkosh Correctional	Sep-02
Poynette Schools	Dec-97	WEI Taycheedah Correctional	Mar-03
Lake Mills Schools	Jan-96	WEI Waupun Correctional	Dec-00
Richland Center	Jun-97	WEI Racine Correctional	Feb-03
Lodi School District	Dec-97	WEI Fox Lake Correctional	Sep-03
Adams Friendship Schools	Dec-93	WEI Oakhill Correctional	Sep-03
Oregon Schools	Dec-92	WEI 1 UW Milw I	Dec-92
Wayland Academy	Dec-94	WEI 1 UW Milw II	Apr-93
Cambridge Schools	Nov-03	WEI 1 UW Milw III	Dec-93
Fort Atkinson Schools	Dec-00	WEI 1 GLRF Milw	Dec-95
St. Mary's Hospital - Madison	Jun-03	WEI 1 UW Oshkosh	Sep-93
Walworth County	Apr-03	WEI 1 School for Hearing Impaired	May-93
Dane County	Jan-04	WEI 1 UW Wash Co.	Dec-93
MATC - Milwaukee	Mar-04	WEI 1 UW Whitewater	May-94
Beloit Schools	Sep-99	WEI 1 UW Parkside	Feb-94
Whitewater Schools	Dec-00	WEI 1 Clinical Sciences	Dec-94
Loyal Schools	Jun-94	WEI 1 DOA	Aug-94
Marshfield Schools	Sep-00	WEI 1 DVA King	Jun-95
Milwaukee School of Engineering	May-92	WEI 1 DHSS Lincoln Hills	Jul-95
Palmyra-Eagle Area School District	Sep-02	WEI 1 UW Stevens Point	Sep-95
VA - Hospital - Milwaukee	Mar-03	WEI 1 UW Madison I	Mar-95
Racine Unified School District	Jan-00	WEI 1 UW Madison II	Sep-95
WEI UW Madison 1	Mar-02	WEI 1 UW Madison III	Mar-96
WEI UW Madison 2	Mar-02	WEI 1 UW Platteville	Jul-95

Name of Project (Table A1 continued)	Project Installation Date (completed)	Name of Project	Project Installation Date (completed)
WEI UW Madison 3	Sep-02	WEI 1 UW LaCrosse	Sep-95
WEI UW Madison 4	Sep-03	WEI 1 UW River Falls	Oct-95
WEI UW Madison 5	Sep-03	WEI 1 UW Stout	Dec-95
WEI UW-Madison 6	Mar-04	WEI 1 DHSS Southern	Jul-96
WEI UW Madison Biotron	Nov-01	WEI 1 DHSS Central	Apr-96
WEI UW-Madison Charter I	Oct-01	WEI 1 DHSS Mendota	May-96
WEI UW-Madison Charter II	Oct-01	WEI 1 DPI Janesville	Jul-96
WEI UW-Health	Sep-03	WEI 1 UWC Fox Valley	Jul-96
WEI UW Oshkosh	Dec-01	WEI 1 UWC Marinette	Jul-96

Table A2. Projected Annual Energy Savings By JCI Energy Performance Contracting Project

Project Name	Annual Energy Savings				
	Dollars ($)	Electricity (kWh)	Natural Gas (Therms)	Steam (Mlbs)	Water (gallons)
Lake Superior State University	$261,692	2,362,356	162,541		9,223,672
Brown Deer Schools	$105,620	933,849	85,292		
Aurora Hartford Hospital	$19,878	310,900	14,900		164,250
Aurora Heil Facility	$46,988	434,871	75,480		
Aurora Kenosha Hospital	$23,326	317,706	13,599		
Cedarburg School District	$62,620	554,628	48,963		
Port Washington School District	$30,670	293,556	20,825		
Cudahy School District	$46,421	444,315	31,520		
Marquette University	$413,478	5,133,251		20,319	24,320,000
Columbia Health Care Center	$26,188	149,336	20,313		
Nicolet High School	$37,062	354,736	25,165		
Germantown School District	$35,164	329,443	23,480		
Grafton School District	$7,020	67,191	4,766		
UW Marinette	$7,371	45,785	10,874		
Wittenburg School District	$36,590	412,306	45,220		
Hayward School District	$33,500	378,071	14,475		
Elmbrook Memorial Hospital	$25,808	291,261	11,152		
Sun Prairie Schools	$51,180	1,023,600	58,491		
Poynette Schools	$26,272	172,584	11,303		
Lake Mills Schools	$32,966	272,343	35,378		
Richland Center	$28,479	356,301	19,332		
Lodi School District	$26,224	276,805	18,780		
Adams Friendship Schools	$19,935	48,939	29,927		
Oregon Schools	$31,920	358,833	60,443		
Wayland Academy	$14,874	117,991	23,624		
Cambridge Schools	$20,938	203,864	22,419		
Fort Atkinson Schools	$35,893	550,782	16,471		
St. Mary's Hospital - Madison	$110,997	264,364	188,028		
Walworth County	$52,541	615,480	19,460		
Dane County	$60,100	911,634	8,831		
MATC - Milwaukee	$39,552	113,463	52,664		
Beloit Schools	$9,387	173,233	14,891		
Whitewater Schools	$12,316	83,362	20,245		
Loyal Schools	$19,007	222,653	7,040		
Marshfield Schools	$82,304	888,862	67,508		
Milwaukee School of Engineering	$73,788	864,374	27,329		
Palmyra-Eagle Area School District	$49,224	318,686	15,711		
VA - Hospital - Milwaukee	$396,096	461,382	327,625		
Racine Unified School District	$170,000	1,991,429	62,963		
WEI UW Madison 1	$145,196	1,410,891		22,200	11,847,958
WEI UW Madison 2	$102,097	1,558,032		4,510	11,464,001
WEI UW Madison 3	$278,482	2,835,805		39,380	16,765,000
WEI UW Madison 4	$503,239	5,508,401		52,807	48,808,530
WEI UW Madison 5	$567,185	7,320,949		50,181	36,630,195
WEI UW-Madison 6	$411,162	4,440,444	337,248		

Project Name (Table A2 continued)	Annual Energy Savings				
	Dollars ($)	Electricity (kWh)	Natural Gas (Therms)	Steam (Mlbs)	Water (gallons)
WEI UW Madison Biotron	$38,149	754,367		2,795	
WEI UW-Madison Charter I	$312,000			2,847,123	
WEI UW-Madison Charter II	$730,000	999,999			
WEI UW-Health	$261,432	2,412,385		47,650	27,915,485
WEI UW Oshkosh	$167,729	537,250		10,761	24,483,298
WEI UW Fox Valley	$22,717	174,697	25,125		
WEI UW Sheboygan	$25,067	319,135	11,273		
WEI UW-Rock	$24,764	262,268	29,377		
WEI UW-Parkside	$172,383	3,055,441	14,914	10,313	
WEI UW-Milwaukee 1	$187,893	1,511,267		26,533	
WEI UW-Milwaukee II	$247,673	2,726,504	155,790	24,367	
WEI UW-Milwaukee III	$172,204	2,293,316		22,951	
WEI UW-Milwaukee IV	$142,728	293,704		15,982	93,200,000
WEI UW-Whitewater	$334,537	3,755,546	13,088	31,251	26,932,411
WEI UW Washington County	$19,236	61,710	11,273		2,025,000
WEI UW Waukesha	$40,245	434,636	33,010		
WEI King VA	$20,986	120,892		2,890	
WEI Winnebago Mental Health	$67,222	819,489		2,963	5,831,260
WEI Mendota Mental Health	$51,292	553,940	42,071		
WEI Southern Wisconsin Center	$145,860	1,575,250	119,639		
WEI Green Bay Correctional	$8,233	25,493		1,850	
WEI Kettle Moraine Correctional	$28,726	457,698	27,714		
WEI Oshkosh Correctional	$153,969	291,533	76,937		18,635,000
WEI Taycheedah Correctional	$35,679	46,139	10,931	1,452	4,240,000
WEI Waupun Correctional	$119,200	893,808		20,758	
WEI Racine Correctional	$120,835	1,362,503	58,429		9,167,659
WEI Fox Lake Correctional	$63,115	941,445		3,720	
WEI Oakhill Correctional	$70,763	621,741	24,990	1,678	4,083,700
WEI 1 UW Milw I	$100,000	1,487,507			
WEI 1 UW Milw II	$170,000	4,068,472			
WEI 1 UW Milw III	$400,000	8,200,000			
WEI 1 GLRF Milw	$22,785	297,904			
WEI 1 UW Oshkosh	$275,000	3,500,000			
WEI 1 School for Hearing Impaired	$23,000	290,000			
WEI 1 UW Wash Co.	$14,394	167,747			
WEI 1 UW Whitewater	$235,937	4,022,423			
WEI 1 UW Parkside	$118,716	1,899,761			
WEI 1 Clinical Sciences	$304,626	5,876,845			
WEI 1 DOA	$245,697	3,569,657			
WEI 1 DVA King	$55,408	729,549			
WEI 1 DHSS Lincoln Hills	$19,536	275,229			
WEI 1 UW Stevens Point	$185,115	2,481,273			
WEI 1 UW Madison I	$382,555	7,092,629			
WEI 1 UW Madison II	$493,251	11,470,965			
WEI 1 UW Madison III	$431,972	10,045,860			
WEI 1 UW Platteville	$56,231	844,940			

Project Name (Table A2 continued)	Annual Energy Savings				
	Dollars ($)	Electricity (kWh)	Natural Gas (Therms)	Steam (Mlbs)	Water (gallons)
WEI 1 UW LaCrosse	$131,406	3,055,965			
WEI 1 UW River Falls	$48,107	1,118,756			
WEI 1 UW Stout	$64,268	1,494,611			
WEI 1 DHSS Southern	$8,117	188,769			
WEI 1 DHSS Central	$30,151	701,191			
WEI 1 DHSS Mendota	$35,164	817,765			
WEI 1 DPI Janesville	$8,154	189,627			
WEI 1 UWC Fox Valley	$20,554	478,005			
WEI 1 UWC Marinette	$6,144	142,890			
Total JCI Project Annual Energy Savings	$12,261,675	147,989,543	2,708,837	3,264,434	375,737,419
Total JCI WEI Project Annual Energy Savings	$9,678,286	124,885,018	991,809	3,244,115	342,029,497