Energy Innovators Initiative

Energy Innovators Case Study

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REGINA QU'APPELLE HEALTH REGION: TAKING CARE OF ENERGY EFFICIENCY

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A prescription for energy savings

The Regina Qu'Appelle Health Region does more than look after the day-to-day health care needs of the 245 000 people it serves. It is also doing what it can to provide a healthier environment by becoming more energy efficient.

The Health Region recently took advantage of major hospital redevelopment plans by introducing energy-efficient technologies that led to an 11 percent energy reduction in its two main hospitals, Regina General Hospital and Pasqua Hospital. It has also implemented a cogeneration pilot project to produce electricity from natural gas while capturing the exhaust heat and redirecting it for domestic hot water use at Regina General Hospital.

Now the Health Region is investing another $4.5 million in upgrades to further cut energy costs and emissions while increasing the comfort level of its occupants. Through retrofits to lighting, fans and building control systems and through improvements to its operations and maintenance, the Health Region plans to cut its energy

Wascana Rehabilitation Centre

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Pasqua Hospital

consumption by another 20 percent over six years and reduce greenhouse gas (GHG) emissions by 20 percent, or by 9280 tonnes of carbon dioxide (CO_2).

To achieve these savings, the Health Region has requested assistance from the Energy Innovators Initiative (EII) of Natural Resources Canada's Office of Energy Efficiency. The EII encourages Canadian businesses and public institutions to cut costs by becoming more energy efficient and reduce GHG emissions that contribute to climate change.

"The truly beneficial savings are in the form of reduced greenhouse gas emissions; and as health care providers, we should always be part of the solution," says Peter Whiteman, Manager of Energy Management Services for the Regina Qu'Appelle Health Region. Mr. Whiteman is also Manager of Building Maintenance Services for the Pasqua Hospital.

The Regina Qu'Appelle Health Region covers all public health care services in the former Regina Health District, Touchwood Qu'Appelle Health District and Pipestone Health District. It includes the Regina General Hospital, the Pasqua Hospital and the Wascana Rehabilitation Centre. It offers a full range of hospital, rehabilitation, community and public health services, in addition to home and long-term care throughout southern Saskatchewan.

A healthy start to saving energy

Faced with a major reorganization of Saskatchewan's health care system in the 1990s, the health care facilities located around Regina were combined into what was called the Regina Health District (which was recently expanded to become the Regina Qu'Appelle Health Region). The Health Region seized the opportunity to become more energy efficient in the midst of the sweeping changes as Regina General Hospital and Pasqua Hospital were being redeveloped and expanded to handle the beds and services that were eliminated by the closure of a third acute-care hospital in the area, the Plains Health Centre. The reorganization meant adding 44 406 square metres and a lot of new equipment, as well as expanding the growing hospitals' two energy centres to make sure adequate service delivery requirements were being met.

The Health Region prepared an energy management business plan that identified $1,525,700 worth of energy upgrades (plus a contingency of $240,300 to cover unexpected costs) that would be paid back through energy savings (see Table 1). The upgrades also reduced GHG emissions by 1361 tonnes of CO_2 per year.

"We managed to incorporate a number of energy efficiencies into the whole redevelopment," says Mr. Whiteman. "We netted an 11 percent reduction in utilities per square metre."

To recapture waste heat that is usually lost when exhaust gases are expelled, stainless steel boiler stack economizers were added – one to the Pasqua Hospital's chimney and two to that of the Regina General Hospital. These economizers capture heat from exhaust gases and redirect it to be used to preheat boiler feed water or domestic hot water. About 20 percent of the waste heat is recaptured, resulting in an estimated total natural gas cost savings of over $66,086 per year.

A number of changes were also instituted to make the hospitals' boilers more energy efficient. One of the original high-pressure steam boilers at Regina General Hospital was replaced, and high-efficiency burners and multi-element controls were installed in others. At a cost of $140,700, these upgrades are reducing energy costs by about $41,382 per year.

Extra insulation was added to the steam, heating and cooling pipes to save energy and improve the overall ambient temperature in the energy centres. This upgrade cost $75,800 and provides energy savings of about $17,500 per year.

The Health Region also made a number of chiller upgrades. Installing new absorption chillers at both hospitals shifted the cooling load from an electrical to a natural gas utility source to improve the overall energy use in the summer. A new microprocessor-based control system was also added to optimize building automation systems and energy use.

As part of the push for energy efficiency during the hospitals' redevelopment, new wings of buildings were fitted with T-8 fluorescent light fixtures with electronic ballasts. The T-8 fluorescents save 35 percent on electricity consumption while improving the colour-rendering index. The expected life of the electronic ballasts is twice that of electromagnetic ballasts, and each unit can be wired to four lamps instead of two, which reduces the number of ballasts required. This new lighting technology does not produce as much heat, thus reducing the overall cooling load.

Other energy- and water-saving devices in the new wings include hands-free flush controls in washrooms. Honeywell Inc.'s EXCEL 5000® Building Automation System was installed at both the Regina General and Pasqua Hospitals. This building automation equipment gives operating engineers greater monitoring and control capabilities to optimize building operations and reduce energy consumption.

Lights, fans and building controls

As new equipment is bought and further renovation plans are made, the Health Region is continuing to make energy performance a major consideration. Although its energy centres are considered to be state of the art, there is still room for new energy-efficient technology and retrofits in the older areas of the two hospitals and at the Health Region's third main facility, the Wascana Rehabilitation Centre.

"All three sites have areas that did not benefit from the redevelopment project. Some of the infrastructure at these sites is close to 30 years old," says Mr. Whiteman.

"We have aging infrastructure that has reached its effective life cycle and is now failing us. Major upgrades to our heating, ventilating and air-conditioning (HVAC) and lighting systems will pay for themselves with the dollars we save as a result of reduced energy," Mr. Whiteman says. "We've had to take a very close look at all our fans and infrastructure systems, determine which are in the worst state, and develop a replacement process that ensures a consistent renewal strategy. We're chipping away at it; but with limited resources, it's difficult."

Nine out of the 41 fan systems at Regina General Hospital have been replaced with variable frequency drive (VFD) motors. These new systems can reduce energy use between 10 and 20 percent. For the most part, the motors on the older fan systems are not adjustable. They run continuously at maximum speed, with some units using a sliding or inlet vane to control air volumes. VFDs reduce the speed of the motor to adjust the air volumes to meet the building's requirements.

Table 1. Regina Qu'Appelle Health Region Project Summary

Description	Investment Costs	Predicted Cost Savings per Year	Source of Savings	Simple Payback (years)
Boiler stack economizers	$260,000	$66,086	Natural gas reduction	3.93
Increased insulation standard	$75,800	$17,500	Natural gas reduction	4.33
Efficient burners in heating boilers	$140,700	$41,382	Natural gas reduction	3.40
Absorption cooling of chilled water	$692,800	$96,047	Electricity reduction	7.21
Reverse osmosis make-up water	$97,400	$149,182	Chemical use reduction	0.65
Chilled water circulation	$90,400	$23,600	Electricity reduction	3.83
Condenser water circulation	$113,400	$15,564	Electricity reduction	7.29
Enhanced cooling towers	$55,200	$15,642	Electricity reduction	3.53
Total project cost	$1,525,700			
Total annual cost savings		$425,003		
Total project simple payback (years)				3.59

Control centre in the Health Region

Control centre in the Health Region

To maximize the benefit from VFD upgrades, the Health Region is also looking into upgrading its building automation control system at the Wascana Rehabilitation Centre, which has a mid-1980s version of the building automation control system used at the Regina General and Pasqua Hospitals. Having the same control system at all three sites will also allow maintenance personnel to share ideas and help solve problems.

The new and redeveloped areas at Regina General and Pasqua Hospitals benefited from new energy-efficient lighting technology as part of the major redevelopment. Now the Health Region is working toward upgrading to new energy-efficient lighting-system technology in the older areas. In the end, about 5000 fixtures will be replaced.

Further study is required at the Wascana Rehabilitation Centre before switching to this energy-efficient lighting with its reduced heat output, because this could affect the temperature balance in the Centre's existing heating system. The Wascana Rehabilitation Centre was designed to incorporate passive solar heating and optimize occupant heating sources, such as body heat and the heat from lights and equipment.

Cogeneration pilot project

Together with SaskEnergy Incorporated and SaskPower, the Regina Qu'Appelle Health Region launched an innovative two-year pilot project at Regina General Hospital in October 2002 to evaluate the potential for cogeneration in similar facilities.

Cogeneration produces electricity from natural gas, while capturing and using the exhaust heat for other beneficial purposes. In this case, it is used to heat the hospital's domestic hot water, which is then used for tasks such as cooking and cleaning. Cogeneration extracts the most energy potential from the fuel used. Heat recovery also reduces the overall exposure to fuel price economics and lowers GHG emissions by capturing and recycling waste heat. Natural gas as a fuel source also produces fewer emissions than coal-generated electricity.

SaskEnergy and SaskPower shared the project costs, which totalled about $500,000. Besides providing the host test site, the Health Region is also providing the operating staff.

"This is such a wonderful opportunity for all of the partners. The Health Region is especially grateful to have the utility companies providing the capital, which allows us to concentrate our resources on service delivery and still have the opportunity for exposure to this leading-edge technology," says Mr. Whiteman.

Two 60-kilowatt microturbines generate electricity and heat, producing a total of 120 kilowatts of electricity and about 250 kilowatts of equivalent thermal energy. Electricity generated by the microturbines is delivered into SaskPower's electrical distribution grid. Exhaust produced by the two microturbines is ducted into a heat exchanger and used to heat the hospital's domestic hot water.

The success of the pilot project will be evaluated, in part, on the cost of installing the microturbines compared with the hospital's real energy savings.

"Cogeneration has the best payback when it's running flat out all the time," Mr. Whiteman says. "From 5:30 a.m. to 10:00 p.m., we have a constant load. But after that, there isn't as much demand. And because we can store only so much hot water, we have set up the turbines to be load-following, which provides the best environmental returns but will extend the payback time."

Boiler room

The potential for significant cost and energy savings at these large facilities is enormous.

"If we were to build a completely new facility from scratch, with present-day technology, the opportunities would be virtually limitless," Mr. Whiteman says. "Future possibilities could include this microturbine technology as the primary heating source and as an alternative to our present emergency power back-up system."

A healthy outlook on energy efficiency

The Health Region recognizes the important role people play in reducing GHG emissions. It is creating low-cost education and information programs for its staff of 8470 to promote energy awareness, which will complement its equipment innovations.

As energy-efficient equipment and processes become available to the hospitals, employees are trained in their use by the supplier's field staff, by knowledgeable in-house staff, or through external education and training. Many of the Health Region's employees have attended Dollars to $ense workshops on energy efficiency offered by Natural Resources Canada's Office of Energy Efficiency. Mr. Whiteman intends to use the hospital's intranet system and its monthly internal newsletter to help increase the staff's awareness and point out the role they can play in reducing GHG emissions and to elicit suggestions for further energy savings.

Through its many energy upgrades and its participation in the innovative cogeneration pilot project, the Health Region's efforts to reduce energy use and GHG emissions mean it can spend less on energy bills and more on health care. All of this helps the Health Region contribute to issuing a clean bill of health not only to the people it serves, but also to the environment.

For more information

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