PW122711-05

City of Rapid City

2011

City Depts. Energy Conservation Reports

Written by City Dept. Heads
and
Compiled by Gunar Dzintars
Energy Plant Manager
December 20, 2011

CONTENTS

INTRODUCTION

The following action was taken by the City Council at the Monday, October 17, 2011 Council meeting:

> Require each department director to provide a report detailing what they have done, what they are currently doing and what they will be doing in the future to conserve energy with the final reports to be presented at the December 27, 2011 Public Works meeting

This direction was given in conjunction with the 2010 City Energy Report which was presented at the same meeting. Mayor Kooiker requested that Gunar Dzintars assist in organizing the departmental reports.

The City Dept. reports were received from the Dept. heads and compiled under this cover to fulfill the stated City Council motion. The reports are presented as they were received from the individual Depts. without edits, except for some minor formatting.

The Energy Plant keeps a database that tracks the energy use and costs for all the City facilities, so detailed information is available for any individual City facilities.

RAPID CITY REGIONAL AIRPORT ENERGY CONSERVATION REPORT

Submitted by: Cameron Humphres, Executive Director

This report will detail what the airport has done, what the airport is currently doing and what the airport will do in the future to conserve energy.

The following is a list of the buildings/facilities that will be addressed

• Airport heated Sand storage building	2,400 Sq Ft
• Aircraft & Rescue Fire Fighting Station	5,040 Sq Ft
• Airport shop/cold storage building	7,200 Sq Ft
• Airport TSA building	7,400 Sq Ft
• Airport Federal Aviation Administration Building	10,100 Sq Ft
• Airport SRE Maintenance building	13,000 Sq Ft
• Airport Interagency Dispatch Center/Old Terminal	19,083 Sq Ft
• Airport Terminal	80,000 Sq Ft
	Total 144,223 Sq Ft

Airport Heated Sand Storage Building

2010: Building was originally designed and equipped with a sand conveyer system used for loading trucks. The opening in the side of the building that accommodated the system allowed a great deal of heat to escape the structure. The system had become obsolete due to its position and the size of our sander trucks. The conveyer assembly has been removed and the large hole left in the side of the building has been sealed preventing the loss of heat. In addition, we repaired and "tuned-up" the natural gas heating system, repaired ceiling and insulation.
2011: Replaced thermostats and established new thermostat level between 35-40 degrees. Airport management implemented a "store it where you use it" policy that keeps the equipment needed for sanding inside that facility rather than opening/closing bay doors to relocate the equipment.
2012: Determining the feasibility of making storage capacity larger so only one load a year needs to be delivered, this will eliminate bringing in a second/third load of cold runway sand and storing it on top of an already heated area. In addition, we are gathering quotes for insulated doors to further prevent heat loss.

Airport Aircraft & Rescue Fire Fighting (AARFF) Station

2010: Ground was broke on a new ARFF station, to replace an old and inefficient building.
2011: The New ARFF station was finished and occupied. Official Ribbon cutting was March 2011. The new station is equipped with advanced energy efficient systems:

- Air Handling Unit:
  - Variable Frequency Drive Fan Motors reduce electrical consumption during low demand and un-occupied periods.
  - 100% Outside Air dampers provide free economizer cooling when outdoor temperature and humidity is optimum.
  - Blade and frame edge seals on dampers reduce leakage.

  - Dual Supply and Return/Exhaust fans effectively control building static pressure.
- ERV-1 (Energy Recovery Ventilator): Air to Air Heat recovery Unit captures heat of exhausted air from toilets and showers. 50% of the exhaust heat is captured and applied to the outside makeup air for ventilation. Unit also captures cooling air energy and uses it to pre-cool outside air during the summer.
- ERV-2 (Energy Recovery Ventilator): Air to Air Heat recovery Unit captures heat of exhausted air from equipment bay. 50% of the exhaust heat is captured and applied to the outside makeup air for ventilation. Unit also captures cooling air energy and uses it to pre-cool outside air during the summer.
- Radiant Heaters in Equipment Bay: Gas fired Radiant Heaters and In-Floor Hydronic Heating System heats surfaces, rather than air, in the equipment bay. Radiant Heaters have direct combustion air burners, reducing need to preheat outside air for combustion.
- Air Distribution and Temperature Zone Control:
  - Variable Air Volume (VAV) Terminal units in ductwork. VAV's serve specific zoned areas to provide controlled cooling and heating as demanded by the area/occupancy/and solar exposure, thereby not over heating or over cooling other zones.
  - Fan Powered VAV terminals to provide ventilation air changes to each zoned area. Smaller fan motors use less energy than large AHU fan motor, which allows the AHU VFD to decrease electrical consumption. Typically utilized at perimeter rooms, allowing heating capability at night, during reduced night un-occupied periods, therefore not requiring the larger AHU motor to operate.
- Temperature Controls: Direct Digital Controls (DDC) provide optimal temperature control and operation of the HVAC system through preset and adjustable programs. Programming includes:
  - Building Static Pressure Control
  - Night Temperature Set Back
  - Optimum Stop/Start of HVAC equipment based on historic and current conditions.
  - Time Clocks for Exhaust Fans.
  - Heating Water Temperature Reset based on outside temperature.
  - Discharge Air Temperature Reset based on demand and outside air temperatures.
  - Point Alarms to monitor critical set points such as low air temperatures, equipment failure, etc.
  - Optimum Heating and Cooling Programs to reduce dual heating and cooling modes.
- Boilers: Four boilers, 94% efficient, were are installed. Each boiler is sized at 25% of building load, providing reduced standby losses during mild weather. Boilers and terminal units operate with lower heating water temperatures to increase boiler efficiency.
- Heating Pumps: Heating Pumps have VFD's to reduce electrical consumption by monitoring the Hot Water system pressure and reducing pump flow during low demand.
- Plumbing Systems:

- Low Water Consumption Toilets, (1.6 Gallons per flush) and Urinals, (1 Gallons per flush).
- Domestic Hot Water Re-circulating System. Provides instant hot water at fixture, reducing water wasted down the drain when waiting for hot water, which also reduces energy required to heat the make-up water at the water heater.
- Hands Free Faucets with Infrared Sensors and automatic shut off to reduce water waste.
- Water Heaters are Direct Fired Combustion, 96% thermal Efficiency.

2012: During 2012 we will monitor systems and gather information on where we can look for future energy savings.

Airport Shop/Cold Storage Building

2010: The energy cost of this building has dropped from $1.56 a Sq Ft in 2008 to $0.86 a Sq Ft in 2010 this is due in part to establishing a lower threshold on the facilities thermostats.
2011: Over time, this building has become mostly storage for equipment rather than a working environment. We have reduced thermostat settings and believe the reduction in doors opening/closing and light usage has lowered energy use. Additionally, we no longer keep sand loaded in our road sand spreader when parked in this building. In the past we would keep the building temperature high in order to keep moisture out of the sand to prevent freezing and clumping during sanding operations. Now, we load sand prior to use and empty it when done.
2012: The airport electrician is researching new low energy lights.

Airport Transportation Security Agency (TSA) Building

2010: This building is divided into three separate suites. Suite A was occupied by way-point aviation and they paid all their own utilities. Suite B was and used for conferences and construction meetings. The thermostat in suite B is kept to a minimum and the lights are left off until needed. Suite C is occupied by TSA. The airport does pay the utilities for this facility but recoups costs through the lease agreement it has with the TSA.
2011: Way-point aviation vacated suite A, thermostat has been set to min and lights remain off. All heating and air conditioning preventive maintenance and filter changes for the entire facility were added to the Maintenance Departments Work order program. Proper maintenance and timely filter replacement will increase system efficiency.
2012: We will research the benefits of installing light timers.

Airport Federal Aviation Administration (FAA) Building

This building was demolished in 2010-2011.

Airport Snow Removal Equipment (SRE) Maintenance Facility

2010: The entire buildings heating system was “tuned-up” by technicians, increasing production. Additionally several areas of insulation where repaired.
2011: We increased the frequency of changing filters associated with HVAC unit to a quarterly basis increasing efficiency.
2012: Several of the bays in this structure are only occupied by people for a short period of time. Therefore a light timer system will be researched to determine energy savings.

Airport Interagency Dispatch Center/Old Terminal

2010: Because new the Fire Fighting station construction began in early 2010, no investment was made in the facility regarding energy savings. The Fire Fighters moved out of this facility at the end of 2010/start of 2011. The current occupants will be vacating the building in 2013 and the structure is scheduled for Demolition in 2014; until demolition a small amount of heating oil and electricity will be used for heat the old fire station, this is to keep the pipes that supply water to the rest of the building from freezing in winter. The facility is still occupied by the Inter agency dispatch center, and they pay for all utilizes for their portion of the building.

Airport Terminal

2010: Airport remodel project began in 2010 and is scheduled for completion in 2012. Several energy saving features are included in the remodel:

- Concourse Air Handling Unit:
    - Variable Frequency Drive Fan Motors to reduce electrical consumption during low demand and un-occupied periods.
    - 100% Outside Air dampers to provide Free Economizer Cooling when outdoor temperature and humidity is optimum.
    - Blade and Frame edge seals on dampers to reduce leakage.
    - Dual Supply and Return/Exhaust fans to effectively control building static pressure.
- Car Rental Air Handling Unit: Separate AHU serves this space and can be turned off when un-occupied, reducing motor size and energy required at the larger Terminal AHU.
    - Variable Frequency Drive Fan Motors to reduce electrical consumption during low demand and un-occupied periods.
    - 100% Outside Air dampers to provide Free Economizer Cooling when outdoor temperature and humidity is optimum.
    - Blade and Frame edge seals on dampers to reduce leakage.
    - Dual Supply and Return/Exhaust fans to effectively control building static pressure.
- Terminal AHU/Fan Wall System: Existing Main AHU Centrifugal fan, 24 HP, was replaced with a Fan Wall System, encompassing multiple smaller fans, 7.5 HP each, with VFD control to reduce electrical consumption
- Air Distribution and Temperature Zone Control:
    - Variable Air Volume (VAV) Terminal units in ductwork. VAV's serve specific zoned areas to provide controlled cooling and heating as demanded by the area/occupancy/and solar exposure, thereby not over heating or over cooling other zones.
    - Fan Powered VAV terminals to provide ventilation air changes to each zoned area. Smaller fan motors use less energy than large AHU fan motor, which allows the AHU VFD to decrease electrical consumption. Typically utilized at perimeter rooms, allowing heating capability at night, during reduced night un-occupied periods, therefore not requiring the larger AHU motor to operate.

- Temperature Controls: Direct Digital Controls (DDC) provide optimal temperature control and operation of the HVAC system through preset and adjustable programs. Programming includes:
    - Building Static Pressure Control
    - Night Temperature Set Back
    - Optimum Stop/Start of HVAC equipment based on historic and current conditions.
    - Time Clocks for Exhaust Fans.
    - Heating Water Temperature Reset based on outside temperature.
    - Discharge Air Temperature Reset based on demand and outside air temperatures.
    - Point Alarms to monitor critical set points such as low air temperatures, equipment failure, etc.
    - Optimum Heating and Cooling Programs to reduce dual heating and cooling modes
- Boilers: Existing boilers were larger fire tube boilers with power burners, 75% efficient. Two new boilers, 88% efficient, are now installed. Each boiler is sized at 50% of building load, providing reduced standby losses during mild weather.
- Heating Pumps: New Heating Pumps have VFD's to reduce electrical consumption by monitoring the Hot Water system pressure and reducing pump flow during low demand.
- Plumbing Systems:
    - Low Water Consumption Toilets, (1.6 Gallons per flush) and Urinals, (1 Gallons per flush).
    - Domestic Hot Water Recirculation System provides instant hot water at fixture, reducing water wasted down the drain when waiting for hot water, which also reduces energy required to heat the make-up water at the water heater.
    - Hands Free Faucets with Infrared Sensors and automatic shut off to reduce water waste.
- Lighting:
    - The original lighting was primarily 40W T12 fluorescent fixture. This lamp is driven by rapid-start ballasts resulting in a lumen efficacy of 75 lumens per watt. The new lighting uses T5 and T8 fluorescent bulbs driven by electronic ballasts. The T5 generates 86 lumens per watt, and the T8 will produce 92 lumens per watt.
    - The lighting power density of the old lighting layout was operating at approximately 2.25 watts per square foot. The new lighting on average will result in 0.95 watt per square foot.
    - A new lighting control system will be installed enabling control of the lighting in multiple fashions: automatic occupancy control shutoff, automatic day lighting control to dim fixtures in areas of high ambient daylight, will also give the ability to assign automatic building sweeps to turn lighting on or off.
- Windows: All windows will be replaced with High efficiency thermal pane glass.

CITY ATTORNEY'S OFFICE

Submitted by: Amy Graves, Administrative Secretary
via Tamara Pier, Acting City Attorney

Reasons for Energy Use

The City Attorney's Offices has 6 full time employees.
The office has 4 private offices, 1 conference/file storage room and a central location for administrative staff.
Each staff member has a computer station and phone system.
The office has a copy machine, printer, fax machine, shredder, and coffee pot.

To Reduce Energy

The lights in the conference room are off when the room is empty; the overhead light installed in the sink area is not used; and, lights in individual offices are off when the employee is not on duty. The coffee machine is on a timer which turns off after 1 hour. The computer systems and copy machine have a sleep mode when not in use.

The City Attorney's office will continue with their efforts in energy conservation.

CITY/SCHOOL ADMINISTRATION CENTER

Submitted by: Gunar Dzintars, Energy Plant Manager

This building is occupied by the City of Rapid City (60%) and the Rapid City Area Schools (40%). The following City offices are contained in this building:

- Mayor's Office
- Finance Department
- Human Resources
- Attorney's Office
- Information Technology
- Community Planning & Development
- Public Works Department
- Engineering Division
- Graphical Information Services

The RCAS is responsible for the general care, maintenance, and energy use of this building.

COMMUNITY PLANNING & DEVELOPMENT SERVICES

Submitted by: Brett Limbaugh, Director Growth Management Dept.

At the request of Mayor Kooiker and City Council the Community Planning & Development Services Department has prepared a summary of efforts that the Staff has undertaken to reduce the City's energy costs. Listed below are measures that the Department has developed and is currently following and proposed changes that are under development.

Conservation Measures that the Staff has Established and Will Continue to Perform

1. Staff turns off all electrical equipment every night, including computers, printers, desk heaters/fans, radios, etc.
2. Staff also turns off all computer monitors and office lights, if appropriate, while on lunch or out of the building for meetings.
3. We collect all plastic and aluminum cans for recycling. Aluminum cans are recycled at Ace Salvage or another recycling facility and the proceeds are used to cover the cost of Department petty cash expenses such as greeting cards, for employee funeral condolences, fair wells, etc.
4. We collect all large format prints which are provided to day care facilities for coloring paper.
5. Staff reuses all single sided paper otherwise tossed. This single sided paper can be cut into scratch paper reducing the amount of post-it notes purchased. Single sided copies are also used for printing draft copies of documents to be reviewed and redlined.
6. With the high volume of building inspections the inspectors are coordinating their daily workload to conserve gasoline. Inspectors make a loop in the morning and return for their next shift without returning to the office mid-shift or make making multiple trips from one side of town to the other during their shift.

Conservation Measures that the Staff is Presently Developing

1. We will be moving to electronic submittals for development applications. This will eliminate the need for multiple copies of documents and plans that are presently being distributed to internal and external agencies for review. It will also save staff time because the documents will no longer need to be scanned for long term storage.
2. We have contracted with CRW to implement the new electronic building permit submittal, review, and inspection process which will allow information to be submitted electronically and reduce the amount of paper used in the review and inspection process.
3. We are rewriting zoning and subdivision ordinances to eliminate unnecessary steps and to reduce the number of items that are required to be approved through a public hearing process. Administrative review and approvals by the Department will expedite the development process and while saving paper energy and time.
4. We will be moving to an electronic system for document management to significantly reduce the amount volume of paper documents we currently store both on site and off-site.

RAPID CITY FIRE DEPARTMENT

Prepare, Prevent, Protect

Submitted by: Mike Maltaverne, Fire Chief

As energy costs continue to rise, it is imperative that the Rapid City Fire Department explore and expand upon every possible option to reduce energy costs, reduce our impact on the environment while maintaining the same level of service our citizens have come to expect.

In following the City of Rapid City's Energy Policy, the Fire Department has pursued a number of initiatives to ultimately be in compliance with direction from City Council:

- In July of 2010, Fire Station 7 was relocated to Tish Blvd. and took ownership of a newly constructed facility. The update to new building materials, appliances and fixtures is anticipated to result in a net energy savings over time.
- In the fall of 2010, the Fire Department ceased to respond to nuisance calls for prone subjects or "man down" calls through changing our dispatch protocol. This resulted in an anticipated 500 less calls for service per year for an approximate savings in diesel fuel of $1,000 a year
- In January of 2011, the Fire Department reduced its responses to fire alarms in fully protected (fire sprinkler) buildings to one fire response vehicle in place of 4. This resulted in a fuel savings of approximately $10,000 annually.
- In August of 2011, the Fire Department hired a contractor to come in and provide and assessment on the HVAC system and recommend action to upgrade, maintain or alter the system to improve the efficiency of the system and reduce energy costs. Several recommendations came out of that assessment and have been implemented.
- In November of 2011, through the Capital Improvement Program, the Rapid City Fire Department hired an architect to begin a space/needs study for Fire Station to determine if the existing space is serving the needs of the Department and will provide recommendations in 2012 for future expansion or upgrades to the existing facility to include heating and cooling systems.
- In December of 2011, the Fire Department purchased a quick response vehicle (pick up) to respond to medical calls in place of the large Ladder Truck (Truck 1). It is anticipated that this will save approximately $1,750 in fuel annually.

In addition to changes to facilities and response models, we continue to encourage our employees to find new, innovative ways to reduce our energy costs and our impact on the environment. We recognize that the best ideas often come from our newest employees as have many of these changes.

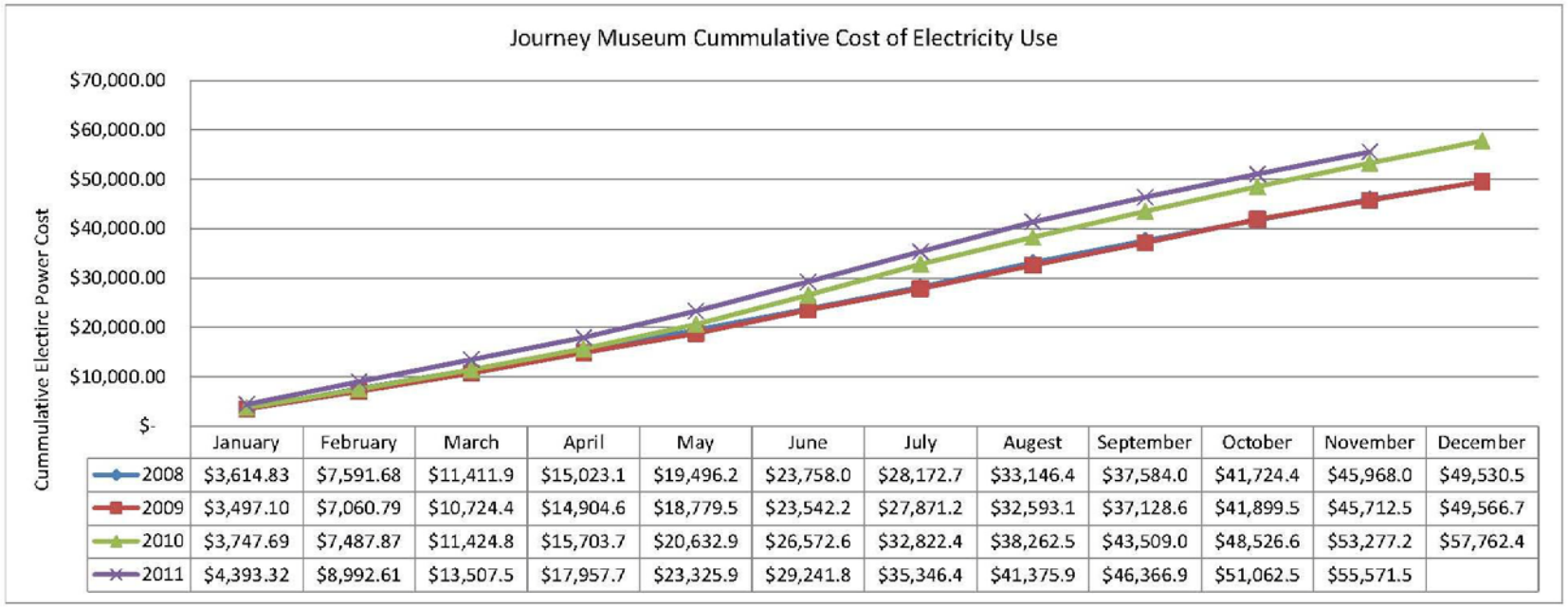
In reviewing the information provided for all City Departments and facilities, the Fire Department is very pleased with our rankings. The Fire Department consists of 135 employees working out of 7 facilities that function 24 hours a day, 7 days a week. In 2010 the Department responded to 12,840 calls for service. In 2011, we are on pace to increase our calls for service to 13,800 for an increase of nearly 1,000 or 7.25% increase. So as we become a busier Department, it will be natural to see our fixed costs increase at a comparable rate. It will remain or become more important to be fiscally responsible to include reducing our energy costs.

JOURNEY MUSEUM

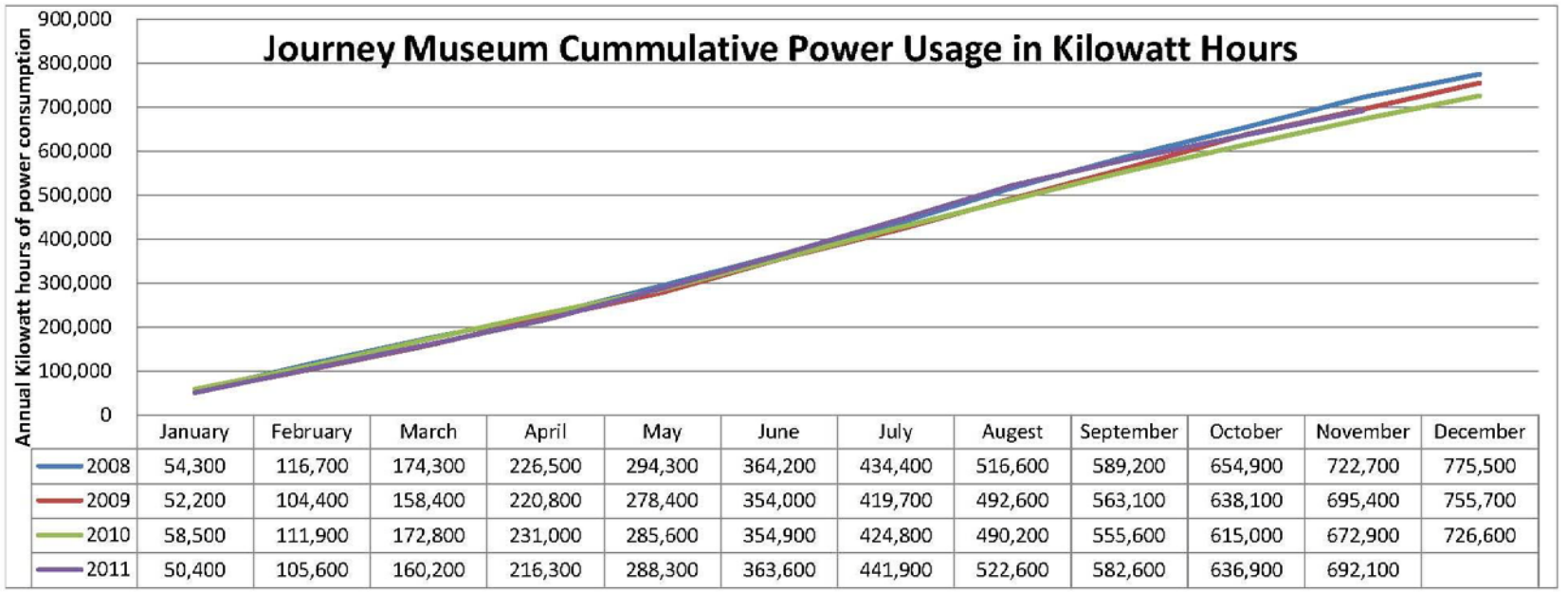
Submitted by: Raymond Summers, Executive Director

The Journey Museum opened May 18, 1997 and we have implemented numerous procedural changes and upgrades to save on energy use resulting in cost savings. What the Journey Museum has done to conserve energy costs?

1. When the museum first opened, the flood lights in the exhibit area would be on full power during the open hours and then at night the flood lights would go to 10% brightness. We decided there was no need to have the lights on at night so we changed the programming to shut the flood lights completely off at night.
2. As CFL lighting became cheaper, we have replaced approximately 250, 90 W (annual power consumption of 72,900 KWH) halogen floodlights with 250 23 W (annual power consumption of 18,630 KWH) CFL floodlights resulting in 74.4% annual reduction in power use. The payback period for the conversion was 7.5 months.
3. When the museum first opened, we were open from 8 am to 8 pm seven days a week. (4368 hours per year) As time progressed, we changed our schedule to better serve our customers. We now are open 9 – 5 seven days a week (728 hours) during the summer, and 10 – 5 Monday – Saturday, and 1 pm – 5 pm Sunday during the winter (2067 hours per year). This results in 1573 hours of less power being used for the exhibits.
4. Some of the exhibits were using 60 watt incandescent bulbs. Those bulbs have been replaced with 13 W and 26 W CFL bulbs. Approximately 50, 60 W bulbs have been replaced with 15, 26 W CFL bulbs resulting in a savings of 2610 watts. Also, approximately 60, 60 watt bulbs have been replaced with 20, 13 watt CFL resulting in a savings of 3340 watts,
5. In the summer, we have implemented plans to save on our water costs which are of course the result of watering our landscape areas. Whereas most facilities in Rapid City charge their irrigation systems in late April and early May, we do not charge up our system until mid-June. Also, we turn off our irrigation system when there is rain. It is irresponsible to have your sprinklers running when there is a downpour. Also, whether there are watering restrictions or not, we only run our sprinklers on even numbered days.
6. In late 2011, we upgraded our hardware and software for the HVAC operating system. With the new operating system, we will be able to better monitor our temperature and humidity of the building. This better monitoring will result in a cost savings as we continue to tweak our system. For those areas of the building that are unoccupied, we can set the temperature to 68 in the wintertime, thereby using less gas to heat the building. Also, when unoccupied, we can shut down exhaust fans in restrooms thereby saving on electrical costs. The system will also allow us to schedule adjustment to individual spaces well in advance based on facility use.
7. The museum's outdoor parking lot lights and walkway lights are on a time clock. When we first opened, the parking lot lights and the walkway lights were on from dusk to dawn. However, we have now set the time clocks, so that these lights come on at dusk but they now shut off at midnight. Some parking lot lights are on a photo cell so they are on of course from dusk to dawn. The parking lot lights use 400 watt metal halide bulbs and the walkway lights use 100 watt metal halide bulbs so the cost savings is quite substantial over the year.
8. Attached are charts that show electric energy use and cost since 2008. Overall, our current (2011) electric consumption is down slightly (0.7%) from the previous 3-year average while cost are up 15.1% compared to the previous 3-year average due to the BHP 20% increase in 2010.

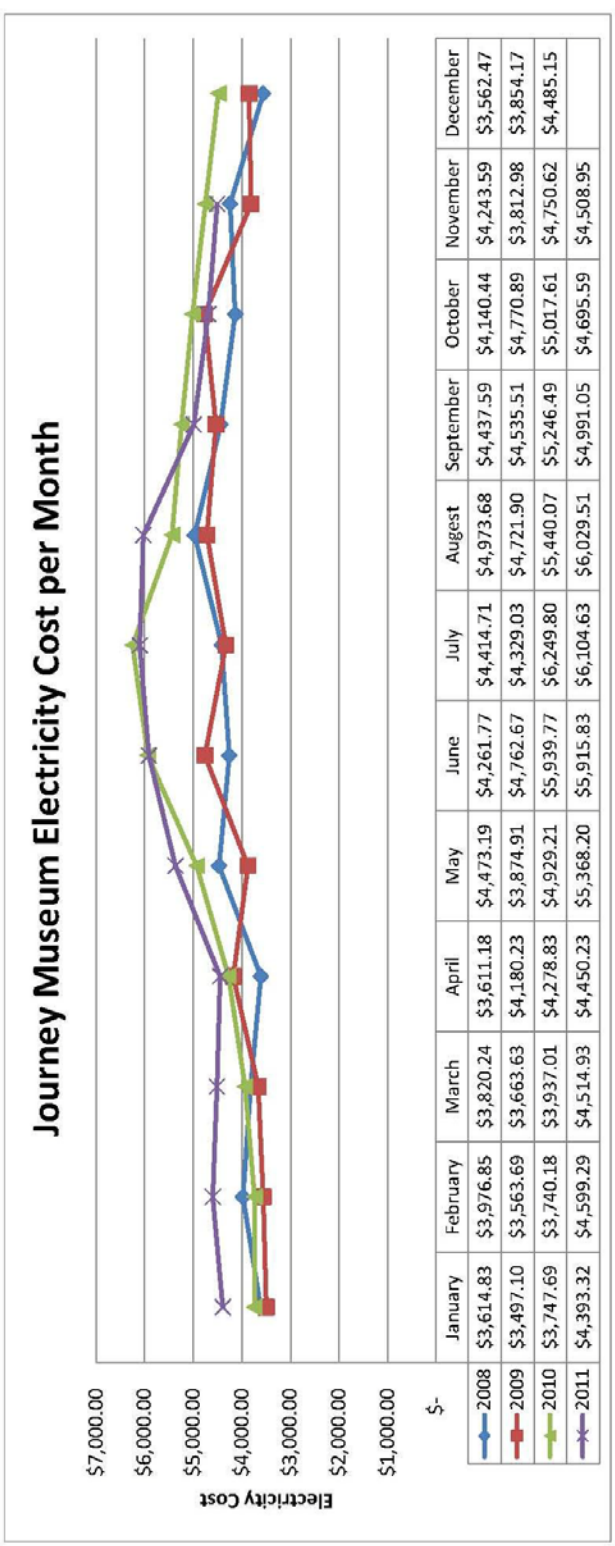


	January	February	March	April	May	June	July	Augest	September	October	November	December
2008	$3,614.83	$7,591.68	$11,411.9	$15,023.1	$19,496.2	$23,758.0	$28,172.7	$33,146.4	$37,584.0	$41,724.4	$45,968.0	$49,530.5
2009	$3,497.10	$7,060.79	$10,724.4	$14,904.6	$18,779.5	$23,542.2	$27,871.2	$32,593.1	$37,128.6	$41,899.5	$45,712.5	$49,566.7
2010	$3,747.69	$7,487.87	$11,424.8	$15,703.7	$20,632.9	$26,572.6	$32,822.4	$38,262.5	$43,509.0	$48,526.6	$53,277.2	$57,762.4
2011	$4,393.32	$8,992.61	$13,507.5	$17,957.7	$23,325.9	$29,241.8	$35,346.4	$41,375.9	$46,366.9	$51,062.5	$55,571.5	

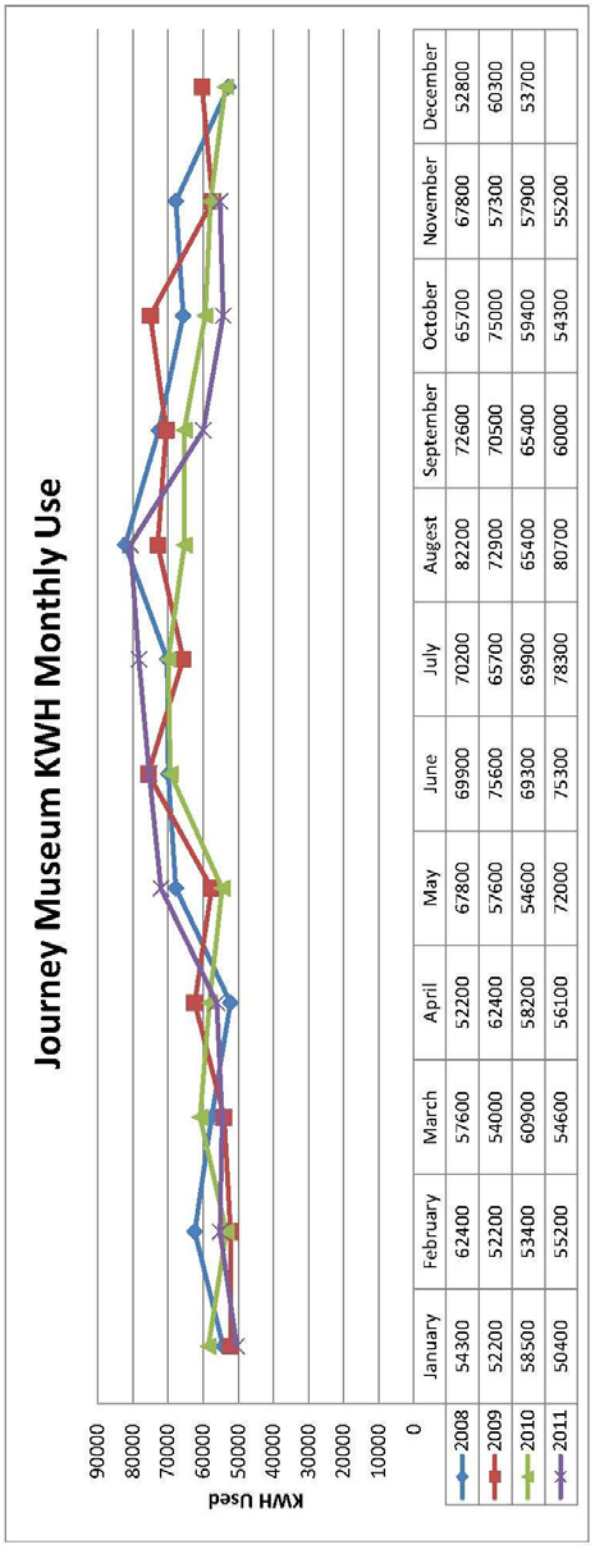


	January	February	March	April	May	June	July	Augest	September	October	November	December
2008	54,300	116,700	174,300	226,500	294,300	364,200	434,400	516,600	589,200	654,900	722,700	775,500
2009	52,200	104,400	158,400	220,800	278,400	354,000	419,700	492,600	563,100	638,100	695,400	755,700
2010	58,500	111,900	172,800	231,000	285,600	354,900	424,800	490,200	555,600	615,000	672,900	726,600
2011	50,400	105,600	160,200	216,300	288,300	363,600	441,900	522,600	582,600	636,900	692,100	

PW122711-05



	January	February	March	April	May	June	July	Augest	September	October	November	December
2008	$3,614.83	$3,976.85	$3,820.24	$3,611.18	$4,473.19	$4,261.77	$4,414.71	$4,973.68	$4,437.59	$4,140.44	$4,243.59	$3,562.47
2009	$3,497.10	$3,563.69	$3,663.63	$4,180.23	$3,874.91	$4,762.67	$4,329.03	$4,721.90	$4,535.51	$4,770.89	$3,812.98	$3,854.17
2010	$3,747.69	$3,740.18	$3,937.01	$4,278.83	$4,929.21	$5,939.77	$6,249.80	$5,440.07	$5,246.49	$5,017.61	$4,750.62	$4,485.15
2011	$4,393.32	$4,599.29	$4,514.93	$4,450.23	$5,368.20	$5,915.83	$6,104.63	$6,029.51	$4,991.05	$4,695.59	$4,508.95	



	January	February	March	April	May	June	July	Augest	September	October	November	December
2008	54300	62400	57600	52200	67800	69900	70200	82200	72600	65700	67800	52800
2009	52200	52200	54000	62400	57600	75600	65700	72900	70500	75000	57300	60300
2010	58500	53400	60900	58200	54600	69300	69900	65400	65400	59400	57900	53700
2011	50400	55200	54600	56100	72000	75300	78300	80700	60000	54300	55200	

RAPID CITY PUBLIC LIBRARIES
ALL YOU NEED TO KNOW
DOWNTOWN • 610 Quincy St. Rapid City, SD 57701 • (605) 394-6139 or (605) 394-4171
NORTH • 10 Van Buren St. Rapid City, SD 57701 • (605) 716-4098

Submitted by: Carlos Ramirez, Facilities Maintenance Supervisor

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Please find the Rapid City Public Library's update on past, present, and future green and energy-saving initiatives below:

Current Projects and Practices – these comply with the City Energy Policy	
Recycling	Receptacles for plastic and cans throughout the libraries, in both public and staff areas
	Battery recycling containers
	Cardboard and newspaper
	Fluorescent bulbs are recycled
Air Handling	Consistent preventative maintenance
Electrical	Light ballast replacement, using energy-efficient ballasts
	Energy-efficient fluorescent or LED bulbs where possible
Janitorial and Chemical	Low VOC and non-acid cleaning chemicals
	Multi-use green cleaning chemicals
	Use of recycled paper products
	Manual towel dispensers (saving of batteries)
Past Projects and Upgrades, complying with the City Energy Policy	
Air handling	Energy-efficient motor starter drives installed on both air handlers
	Variable speed electric motors
	Seal damper replacements
	Chiller coil replacement on Air Handler 1
	Digital thermostats installed
	Air handler 1 New VFD (variable speed driver)
	Air handler 2 New VFD (variable speed driver)
	Electronic actuators installed replaced pneumatic
Boilers	New pumps
	Chemical treatment for longevity of system
	Replaced boilers 1 and 2, closed loop system
Chiller Unit	Replaced with unit 75% more efficient than old one
	Replaced pumps / cooling coil
Rooftop Units	Replaced RTU 1 New higher efficient model
Electrical	Occupancy sensors for office and meeting room lights
	Replacement of parking area lighting with high-efficiency fixtures

	Updated and replaced lighting switches
	Updated procedures for starting and shutting down HVAC systems and facility lights
Water / Sewer	Installed rain sensor for irrigation system
	Installed water-conserving units on toilets and sinks
Structure	Replaced old garage door with insulated one
	Re-glazed all windows and seals, touched up building joints
	Installed air curtain at main public entry to prevent cold air infiltration
	Replaced front entry doors with insulated glass

Proposed Future Projects		
Project	Comments	Estimated cost
Day lighting	System will leave lights off in sunlit areas	$5,000 – $10,000
Lighting upgrade	Completion of inefficient ballasts	$2,000 – $3,000
Insulation		$5,000
Window replacement	Energy efficient glass to replace original 1972 windows	$25,000 - $65,000
Skylights	2-4 on the main floor	$10,000 - $20,000
Solar and wind power	Rooftop units for electricity generation	$10,000 – $40,000
Gray water system	Collection cistern for irrigation, toilets	$5,000 -$8,000
Air handler replacement	Replace original units dating from 1972	$65,000 - $120,000 for AH 1; $25,000 - $50,000 for AH 2
Air-intake system	Replace roof-mounted unit with energy –efficient model	$3,000
Heat system controls	Replace old pneumatic controls with digital	$4,000 – $6,000

DEPARTMENT OF PARKS & RECREATION

Submitted by: Jerry Cole, Parks & Recreation Director

ENERGY USE REMEDIATION REPORT 2011

Facility/Address	Improvement	Year
2915 Canyon Lake Drive	High Efficiency Furnace w/Programmable timer Replaced water heater w/smaller unit Replaced fluorescent lighting with T-8, 12	2010
2919 Canyon Lake Drive	Co-ray-vac (radiant heat)	2001
Canyon Lake Walkway light replacements	Compact fluorescents	2011
Park restroom (6) improvements (Canyon Lake Park, Robbinsdale Park Old Storybook Island)	Insulation Plumbing & lighting motion sensors	2011
515 West Boulevard	Additional insulation Programmable thermostats	2011
Sioux Park Tennis Courts	Court light timers	1995
Roosevelt Park (pond)	Pond aerator timers	2011
Canyon Lake west restrooms (4501 Jackson Blvd)	Insulate for winter use	2008
Greenhouse (headhouse)	New construction New boiler system	1994
Downtown Christmas Decorations	Switching to LED lights	2011

Facility	Improvement	Year
Roosevelt Swim Center	Pool Covers	
125 Waterloo Street	New Lighting in Pool Area	
	Thermostats throughout (Programmable)	
	Replacement of Steam Generators	
	Heating Coil for Pool Area /Air Handler	
Ice Arena	Florescent Lighting	
235 Waterloo Street	Install Insulated Garage Door	2010
	Thermostats throughout (Programmable)	2010
	New Compressors (One Every 3 years)	2010
Outdoor Pools	Pool Covers	

RAPID CITY POLICE DEPARTMENT

Submitted by: Steve Allender, Chief of Police

The Rapid City Police Department occupies space in three buildings. The Public Safety Building is a Pennington County facility that we share with the Pennington County Sheriff's Office, Dispatch, and the Pennington County State's Attorney Office. The shared utility costs for the RCPD is 38%. The Evidence Building is also a shared facility with the PCSO and our shared utility cost is 50%. The PETT building (a city owned facility) houses some Police Evidence storage, City Transportation and City Traffic. The RCPD portion of utility costs is 25%. Due to our unique situation of occupying buildings not always owned by the city, we do not totally control the energy plans for the structure. Despite the situation, we have partnered with Pennington County to improve our overall energy efficiency. The following energy–saving initiatives have been taken:

Current and Past Practices – which comply with the City Energy Policy:

Electrical

- Lighting retro fit ceiling bulbs from 32 watt to 27 watt high output T8's
- Installed occupancy sensors in offices and conference rooms
- Converted exterior entrance lights to LED bulbs
- Converted exit signs to LED bulbs

Water/Sewer

- Installed low flow faucet aerators in bathrooms and showers
- Installed low flow flush valves in restroom/locker room toilets

Heating/Cooling

- Upgraded boiler systems
- Nighttime setback temperature controls
- Installed two new VFD (variable speed drive) air handlers

Structures

- Installed storm gaskets on exterior doors
- Re-calked all windows
- Installed energy efficient glass to the additional two floors at the PSB

Future

Regarding future proposed projects I would refer to the new Evidence Building that is going to be built in 2012. This building is still in the planning stages. I have been informed it is being designed with energy efficiency as a priority. It will have high efficiency HVAC systems, water conserving fixtures, and high efficiency lights. At this time I do not have all of the specific details but could produce this information at a later time.

RAPID TRANSIT DIVISION

Submitted by: Rich Sagen, Transit Division Manager
via Terry Wolterstorff, Public Works Director

Listed below are the measures taken to conserve energy in the Rapid Transit System Division:

PETT Building

The PETT building was completely renovated in 2008-2009. The latest energy saving techniques and materials were employed with the remodel. A list of improvements follows:

- Replaced older non-insulated overhead doors with new energy efficient insulated overhead doors.
- Upgraded HVAC system to be more efficient.
- Provided insulation and caulking in all areas of building where needed.
- Replaced all windows with energy efficient replacements.
- Replace all incandescent lighting with high efficiency fluorescent lighting .
- All temperature controls are monitored by energy plant to ensure maximum efficiency.
- All interior lights are turned off when building unoccupied.
- All future improvements will be made with energy conservation in mind.

MBTC Building

The MBTC building was completely renovated in 2009-2010. The latest energy saving techniques and materials were employed with the remodel. A list of improvements follows:

- Replaced and upgraded exterior doors to improve functionality and improve insulation capabilities.
- Replaced HVAC system with energy efficient unit.
- Replaced boiler unit with energy efficient unit.
- Replaced all exterior windows with energy efficient units.
- Replacement all interior incandescent lighting with high efficiency fluorescent fixtures. All lights are on motion detectors and shut off after a set time period when no one is in area.
- Replaced the entire roof with energy efficient membrane system.
- Replaced entire exterior siding with Hardie Plank and wrapped with insulating Tyvek.
- All building penetrations and joints were caulked.

- All computers are shut down at the end of the business day.
- All landscaping materials used on sight were selected to be drought tolerant and require little water.
- Soda vending machines were removed to conserve on energy consumption.
- Hot water temperature turned down to conserve energy.
- Through controls, the building uses temperature set back at night to conserve energy.
- All future improvements will be made with energy conservation in mind.

All irrigation is underground and set on timer to conserve water. Watering is conducted on odd/even basis as established by ordinance and is performed in the early morning hours.

CITY OF RAPID CITY
Public Works Department

SOLID WASTE DIVISION

Submitted by: Karl Merbach, Solid Waste Division Manager
via Terry Wolterstorff, Public Works Director

Initiated Energy Cost Saving Measures

Through November 30, 2011

- In the Primary Co-compost building, staff electricians completed change out of sodium lighting for fluorescent lighting. While saving in energy consumption, the room is brighter and fewer lights are needed to accomplish more light.
- The Primary Co-compost building is running on a reduced use of the mechanical makeup air units and exhaust fans during periods when temperatures are above 42 degrees and during evening hours when staff is not present. By shutting down these units and letting natural airflow work for us, this has equated to about a $2000 per month savings during cooperating months.
- The Refining building was converted to fluorescent lighting resulting in energy savings and the need for replacement of existing sodium fixtures. The cost of purchasing the existing type fixtures would have been more than the fluorescent.
- Began operating DANO drums on lower speeds when not filling drums. Running on lower speed saves 300 hp on each drum. During normal operation, the electric cost for operating drums is approximately $48/hour.
- A new truck plug in station was constructed south of MRF building utilizing fluorescent lighting. This keeps our equipment ready for cold weather and saves money in energy, repair, maintenance man hour and costs.
- 10 hour work week has been implemented for MRF operators , so far we have ran more material taken in more biosolids with less energy than previous scheduling and can hope to see more advantages as crew gets used to handling the new hours and new situations.

Anticipated Energy Cost Saving Measures - 2012-2014

- 2012-2013: Refining is being assessed for possible moving and reconstruction to the secondary building, which is not utilized to its full potential because of problems it with the original design. Relocating the co-compost refining operation to the present secondary building should save money in diesel fuel, man hours, and less down time because of inclement weather. During high winds this operation must be shut down to prevent littering of waste materials. There is also major concern with electrical problems with water infiltration into the underground conduits. The relocation will result in less conveyors needed to do faster

separation of materials at a cleaner pace, saving time and energy. Building can be used for storage of new garbage cans that now sit in the weather elements and ultraviolet destruction.

- As of 11/30/2011 fluorescent lighting fixtures have been purchased for the Dano Drum building and the Baler Room. Installation will take place winter of 2012.
- 2012- Replace all sodium in Tip Floor
- Tests were done on October 11th, 12th with a slow speed grinder in the tip floor that will reduce size of material going to Dano drums. The thought is that all material coming into landfill could be brought through MRF size reduced, less plugging of conveyors, utilizing magnets and eddy current possible a screen to maximize recovery of metals and capitalize on money coming from waste. This also should make the ability to use one drum rather than two using more biosolids saving the waste water plant money and sending sized reduced materials to hill or pit. This should take less time for compacting higher densities and lower stress to equipment along with the fuel savings. Cost savings of Danos could be significant along with less maintenance. Danos cost about $48.00 per hour to electrically power times 252 days.
- 2013-2014- Redesign biofilter for efficiency and dual productivity and less need for yearly care, which will end up saving money and energy while producing a quality product in less time. This transition should save a large amount of diesel fuel and equipment downtime due to the cost of annual rebuilding one bio-filter cell. This also allows time for operators to effectively handle other needed areas at the landfill and MRF.
- 2012-Conversion of Landfill Maintenance Buildings to Landfill Gas for heating.
- 2012-2013- Conversion of MRF and Co-compost buildings to Landfill Gas for heating during winter months.
- 2013?- installation of solar panels on MRF and Co-compost buildings for generation of electricity or building heat.
- 2014?- Installation of a gasification system to convert organics into alcohol or fuel for trucks. In the initial investigation stage at this time.

Public Works Department

STREET DIVISION

Submitted by: Don Brumbaugh, Street Superintendent
via Terry Wolterstorff, Public Works Director

Energy Report Update

For the past several years, Gunar has been sharing his numbers on energy with the various departments and divisions, including the Street Department. Streets has taken those reports over the years and tried to figure out ways to cut down on fuel & electricity consumption.

Projects Completed to Date

- Replacement of the old garage doors in shop #'s1 & 2 and replaced them with insulated doors
- Installed waste oil heaters in shop #1, the sweeper storage barn; & the equipment storage building –all located on Steele Ave. By utilizing the waste oil products generated in the shop, Streets has drastically reduced consumption of natural gas for heat
- More efficient florescent lighting fixtures have been installed in shop # 1. Within the next few weeks, we plan to update the light fixtures in the break room with more efficient fixtures.
- Motion sensitive light switches have been installed in the men's locker room and break room

On a daily basis, all the supervisory personnel do a lot of "walking and talking" to remind employees to shut off computers, avoid idling equipment, shut off lights, etc., to save all the fuel and energy we can.

Future Plans

As far as future plans, Street's office and shop need to be replaced. We've out-grown the facility; the building is old and has been modified so many times that we're running out of options and ideas for energy saving; the hvac system is not energy efficient nor was it designed to handle the present configuration of the building.

We'll keep working at it…

WATER DIVISION

Submitted by: John Wagner, Water Superintendent
via Terry Wolterstorff, Public Works Director

Listed below are the actions that we have taken in the past, energy conserving measures that we are currently practicing and goals for future energy conserving measures.

Past

- Replaced older non-insulated overhead doors with newer insulated overhead doors.
- Replaced older gas fired area heating units with higher efficiency heating units (as they wear out).
- Insulated older, above ground, block pump house structures.
- Installed capacitor banks at the Water Treatment Plant in order to correct the power factor.
- Replace older incandescent light bulbs with newer compact florescent lighting (CFL).
- Installed software in the supervisory, control and data acquisition (SCADA) system to reduce electric motor starts during the peak electrical demand time (summer months).
- Replaced older single pane windows with double pane insulated windows.
- Lower all thermostats in the Water Treatment Plant and below ground installations (booster stations, valve pits and reservoir pits).
- Installed programmable thermostat in the office areas of the Water Treatment Plant.
- Replace older inefficient motors (80% - 85% efficient) with newer higher efficient (95% efficient) motors as they wear out.
- Limit the amount of time vehicles are allowed to “warm up” (15 minutes) during the winter months.
- Reminders to not let vehicles run unattended.
- Install and maintain weather stripping on all doors.
- Installed cove heating in the lunchroom at the Water Treatment Plant.
- Installed efficient gas heating system at the Utility Maintenance Garage.
- Installed water efficient fixtures at Water Treatment Plant and outlying stations.
- Installed underground irrigation system to maximize irrigation practices.
- Make sure all lights are off in areas not being used.
- Turn off computers outside of work hours.

Present

- Continue to change out older electrical equipment and lighting with higher efficiency units as they wear out.
- Continue reminders on proper vehicle use.
- Designed one of the new underground installations to operate without heat (Kepps Reservoir Project).
- Lengthen reservoir fill cycles to reduce the number of starts per month on electric motors.

Future

- Insulate the metal panels below the picture windows at the Water Treatment Plant
- Install variable frequency drive (VFD) units on booster pumps where the flow needs to be varied. These units will be replaced as the older units wear out.
- Continue to upgrade older inefficient electric motors to the newer higher efficient motors.
- Meet with Black Hills Power and Light to obtain a meter reading schedule of all stations. Develop a spreadsheet for the operators to use so no pumps are started (unnecessarily) at the end of a billing cycle, thus saving the electrical demand charge for the entire month.
- Meet with Black Hills Power and Light to study the feasibility of installing capacitor banks on outlying pumping stations for power factor correction with the end result in the saving of power and cost.
- Install programmable thermostat in the Water Production Group lunchroom at the Water Treatment Plant.

WATER RECLAMATION DIVISION

Submitted by: Dave VanCleave, Water Reclamation Superintendent
via Terry Wolterstorff, Public Works Director

Water Reclamation Energy Studies

The Rapid City Water Reclamation Facility Cogeneration Report was authored by Burns and McDonnell Engineering Company Inc. in November of 2009. The primary reason for the study was to determine the best technology for heating the anaerobic digesters. This report gave the results of an investigation into the potential benefits of installing a gas to energy system at the Water Reclamation Facility. The conclusion was that it would cost the City an additional $409,000 over 20 years to implement such a system. For purposes of the study, electric rates were projected at 10 cents per KWH which is almost double the current rate of 5.8 cents per KWH.

Recommendations were brought forth in a study done by Stanley Consultants in a comprehensive city wide report titled: Energy Efficiency and Renewable Energy Initiative. This study was completed in April of 2010. This report provided somewhat of a cursory look at possible energy saving alternatives for the City. Neither of the recommendations for Water Reclamation has been implemented to date. The recommendations were:
REO 3 – Biogas to Electricity with an estimated cost of $525,000 w/ payback of 4.6 years. *(This report contradicts the previous Burns & McDonnell Cogeneration report, however the limited scope of the Stanley Study, and the assumptions made cast significant doubt on this particular recommendation.)*
Elect 7 – Aeration Blower VFDs with an estimated cost of $396,000 w/payback of 4.7 years.

Rapid City has been selected to participate in Wastewater Energy Audit conducted by the South Dakota Department of Environment and Natural Resources this fall. The audit is being provided at no charge to the City. The study is being conducted by HDR, and will provide a more in depth look at potential energy efficiency improvements. Onsite meetings & investigations will be conducted in early December.

Energy Efficiency Projects

In 2009, the Utility Maintenance Group replaced the overhead doors on the wastewater shop with insulated doors to improve heating efficiency. The doors cost $4,640.00.

In 2010, the Water Reclamation Facility completed replacement of the main motor control center as part of the WRF Improvements Project. The new motor control center is a “smart m.c.c.” which offers

improved monitoring of electrical usage and equipment. The new units also have built in capacitors to reduce reactive current, or “demand charges” by reducing energy spikes during equipment starts.

In 2011 the WRF staff made improvements to building lighting in the trickling filter operations building basement, replacing incandescent lighting with high efficiency fluorescent light fixtures. This has also been done in the sludge handling building load out bay, and is planned for the water reclamation shop as well. The cost of the fixtures was $1,943.37

The facility is currently in the process of replacing inoperative electric heaters with higher efficiency propane heaters in the sludge handling building load out bays. This will eliminate the use of portable supplemental kerosene heaters. The projected installed cost of the new heaters is $5,070.00

In 2012, as part of required repairs to the plant Ultraviolet Disinfection System, the facility is planning on replacing ½ of the UV lamps with a new ”greener”, higher efficiency lamp. The new Ecotherm lamps contain 80% less mercury and use 20% less energy to provide the same germicidal output. Lamp replacement costs are estimated at $55,000.00. The remaining lamps will be replaced in 2013.

Rushmore PLAZA CIVIC CENTER
CENTER OF IT ALL!

Submitted by: Tracy Heitsch, Assistant General Manager/Finance
Gunar Dzintars, City/School Common Energy Plant Manager

ENERGY EFFICIENCIES REPORT

RECENT IMPROVEMENTS

- We exchanged hundreds of incandescent bulbs to CFLs throughout the facility – still in process
- Added a VFD to the Ice Arena pump to increase energy efficiencies
- Remodel of HVAC in LaCroix Hall to include replacement of collapsed duct work – added new duct work - increased controls - added VFDs, etc
- Replaced over a dozen 30+ year old water heaters throughout the facility with new energy efficient units
- Replaced the three huge boilers in the Barnett Arena
- Installed over 30 touch free, infrared hand dryers throughout the facility to eliminate paper towels and "GO GREEN"
- Installed multiple touch free, infrared water faucets in the facility restrooms to conserve water

PLANNED FUTURE IMPROVEMENTS

- Continued replacement of bulbs with CFLs to improve efficiencies
- Weather stripping all exterior doors
- Need to budget to change out all existing 2x4 T-12 light fixtures with new energy efficient 2x4 T-5 fixtures
- Need to budget to add VFDs and energy efficient motors to all fan rooms (11 fan rooms)
- Energy Plant upgrade includes installation of pumps in our facility (vs installation of pumps in Energy Plant as they currently are) to increase efficiencies in distribution of hot and cold water for heating and cooling throughout the Civic Center Facility
- Energy Plant upgrade will allow removal of circulation pumps installed throughout the facility that were used to "push" heating and cooling – their elimination will safe electrical $$

ENERGY PLANT UPGRADE

An upgrade project for the City/School Common Energy Plant is currently in the design stage. The planned bid date is February 1, 2012. This is a shared project between the City of Rapid City and the Rapid City Area Schools. The two entities will share the budgeted project cost of $7,000,000. The design contains the following energy-saving improvements and equipment:

- Boiler replacement with VFD-controlled pumps. Approximate 20% energy savings.
- Chiller replacement with optimization program and VFD-controlled pumps. Approximate 70% energy savings.
- New high efficiency lighting.
- Pump and control upgrades in the Civic Center and Central High School to make more efficient use of the Energy Plant upgrades.