2009
Wisconsin Energy Independent Community Partnership

25 x 25 Plan for Energy Independence

Report completed by:

Osceola Energy Independence Team

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Wisconsin Office of Energy Independence

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Overview

Introduction

The Wisconsin Office of Energy Independence (OEI) administers energy programs to assist Wisconsin to profitably and sustainably promote energy efficiency and renewable energy resources. The goal of the Wisconsin Energy Independent Community Partnership administered by the OEI is to effectively increase energy independent assessments for Wisconsin communities. Currently, there are many communties across the State of Wisconsin interested in implementing and adopting renewable energy and energy efficient projects. This program will assist 10-15 communities that could be potential pilots or models for completing an energy independence assessment, allowing the community to then move forward with energy efficiency and/or renewable energy projects.

Definition

- Energy Independent Community (EIC) – a community that is willing to set a goal of "25 by 25" to increase our energy independence, and promote a sustainable energy policy for the State of Wisconsin

Objectives

The objectives of the Wisconsin Energy Independent Community Partnership are to:

- Increase the use of renewable energy and renewable fuels by 25% by 2025 in across the State of Wisconsin.
- Increase and promote public awareness regarding the benefits of increased energy conservation, energy efficiency, and renewable energy use by counties and municipalities around the state. These benefits include and are not exclusive to: clean air and water, intelligent land management, rural and urban economic development, as well as state and national energy independence.

Eligible Participants

Applicant must be a Wisconsin county, city, village or town that has shown willingness to improve the community's efforts related to energy conservation, efficiency and potential renewable opportunities. Applicants, if they are responsible for their own municipal water, sewer, or electrical system, must be in compliance with all appropriate state and federal regulations.

What was measured? Why?

The Osceola Independent Project of 25% by 2025 was a joint effort between the Osceola School District and the Village of Osceola. Energy consumption was measured that included all energy use in facilities, infrastructure and liquid fuels for vehicles. The units of measurement were therms of natural gas, kilowatts of electricity and gallons of liquid diesel and gasoline for vehicles. The Village and school staff compiled those units of use for calendar years of 2006, 2007, 2008. The data was then analyzed by the Energy Center of Wisconsin with 2008 serving as the benchmark to establish the 25% reduction goal by 2025. A 1% annual growth rate was used to calculate the amount needed to meet the intended goal.

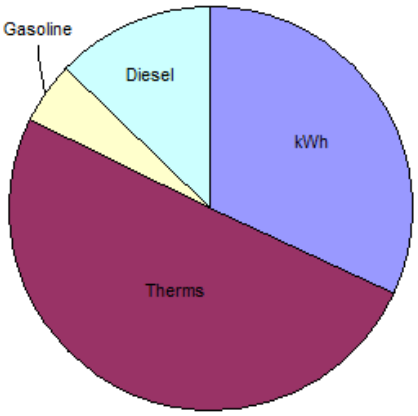
The following graph shows consumption by energy type and where the end use of the energy occurred.

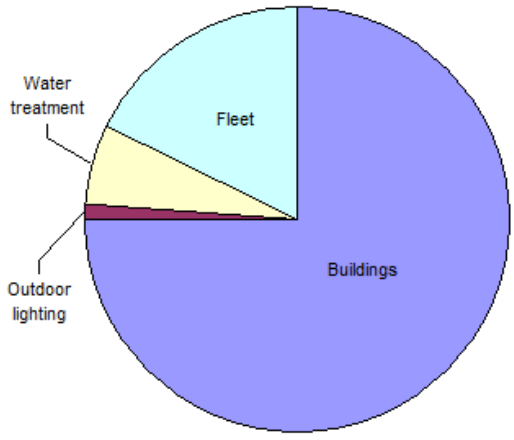
Total Consumption by Energy Type

Energy type	*Percent of total Btus*
Electricity	32%
Natural Gas	50%
Gasoline	5%
Diesel	13%

Total Consumption by End Use

Energy end use	*Percent of total Btus*
Buildings	75%
Infrastructure	7%
Lighting	*1%*
Water	*6%*
Fleet	18%





Additional energy measurements and analysis are included in the appendix at the end of the report (pages 15-18).

Discoveries/Surprises

1. The amount of individual energy measurements and places of usage are usually not one of high awareness before an exercise like this. Until energy use is spelled out by units of therms, kWhs, or gallons of liquid fuels, village and school board members normally think of energy from a cost budget line perspective. When the total amount of energy used by individual units and locations are tabulated, the initial amounts are difficult to understand and comprehend at first. After considerable discussion to understand the amount used and where usage occurs, the amount of reduction then needed for meeting the goal is a rather daunting challenge.

2. It was surprising to us the percentage of energy used by the school buildings. Approximately 72% of all energy usage in the project occurred within the school buildings. When the fleet usage of liquid fuels is added, the school used 86% of all energy in the exercise and thus became the focal point of energy reduction. This does not mean that the village will not utilize energy saving investments and measures as a result of the grant. (page 15)

3. As we progressed through the project, it became apparent that a number of inexpensive conservation matters were available. Low cost measures such as reducing the temperature settings in the school educational buildings by 2 degrees resulted in a 5% energy reduction. With school usage at 214,800 therms of natural gas, that amounted to 12,200 therms or about 5 % of our goal without any cost. The temperature settings had been at 70° during the day and 62° at night. It now is set at 68° daytime and 62° at night in each of the four main educational facilities.

4. Additional low cost measures also became apparent during the project. Educational programming on conservational driving practices for school bus drivers, village employees, and police officers all were held. Low cost investments with a quick payback in computer controlled management of lighting systems within and outside of school buildings, and timers to control plug in tank heaters on buses stored outside in cold weather were all utilized to help meet the goal.

5. The age of buildings did not make a difference in energy usage, but upkeep and age of students did. The oldest school facility was almost as efficient on a per sq. ft. basis as the newest school building. The high school used more because of extended hours of use and larger volume areas such as a 2500 seat gymnasium and a 599 seat auditorium. Additional equipment such as more computer labs, shops, and CAD systems were more prevalent with the older students. Village buildings were less efficient with similar use due to

construction practices used in the 1970's with fewer energy saving updates incorporated over time. (Page 18)

6. The middle school energy use was 33% greater than the next school facility on a per sq. ft. basis and it was attributed to the energy used by the pool. Graphs and charts are included in the appendix that shows the impact of the pool for energy usage for both electricity and natural gas.(Page 15)

7. After the school invested in 32 solar panels during the summer of 2008 and realized energy savings from renewable sources, it then led to installation of thermal blankets on all three pools. This led not only to additional heat being transferred into the domestic water use in the middle school, it resulted with reduced overall water use from less evaporation, less chemical use, less time the dehumidifiers in the pool area were running, and one less day of village wells pumping water during the year. The cascading effect of conservation practices from the solar collectors and thermal blankets on the school pool is also included in the appendix.(Pages 20-22)

8. As we progressed during the year long exercise, it became apparent that conservation would only go a limited amount towards reaching the 25% goal. We needed to look at generating renewable sources of energy and the geothermal applications for the high school, middle school, and intermediate school buildings all were the most viable. They were economically feasible in terms of payback, access to the mechanical rooms, and expected useful life of the facilities. The elementary being over 45 years old and the location of mechanical HVAC equipment all were not conducive for a geothermal installation. (Page 19)

Total Projects Considered

- Generating electricity from wastewater treatment plant outfall utilizing microturbines with a 100 feet head to discharge in the St. Croix River and a 30 foot waterfall in the Village.
- Additional insulation for all village and school buildings including new windows and doors
- Low hanging fruit- economical driving practices for bus drivers, police staff, and village crew; and other low cost energy conservation practices
- Turning down heating settings in school buildings
- Replacing middle school 1983 A/C unit with a more efficient unit
- Hybrid & electric vehicles for school and village including CNG school buses
- Replace gas and diesel fuels with SVO or CNG
- New roofs for school and village buildings and potentially a sod roof for the middle school
- Anaerobic digester or community gasifier for energy production
- School funded study on renewable energy sources such as solar, wind and geothermal
- Solar panel heating for spaces and air exchange systems
- Wind turbines for electricity production

Pathways to 25 x 25

5 Priority items had been identified:

- Additional conservation of energy in buildings
- Geothermal application for the schools
- Anaerobic digester for producing electricity
- Replacement of fossil fuel with alternative fuels
- Replace middle school roof

Projects Selected – Explanation

Ultimately we selected 6 different projects which are briefly summarized in regards to energy saved, energy generated, cost, and meeting the goal of 25%.

1. Additional conservation of energy in buildings:

   A. Turning down the thermostat in school buildings saved 12,200 therms at no cost.
   B. Computer program controls to save 189,000 kWhs at an expense of $36,192
   C. Replace 1983 middle school A/C unit saves 25,000 kWh at an expense of $80,000
   D. Solar panels produce 4,000 therms annually, blankets conserve 2445 therms, and less demudifier use saves an additional 49,000 kWhs annually.

All together these measures with the state mandate got us to 15% of our goal. It then became apparent that an additional project was needed to generate renewable energy to meet the goal.

2. Geothermal heating and cooling for the three school buildings will save 125,000 therms of natural gas, use an additional 955,000 kwhs of electricity, cost $1,680,000 and get us to 118% of the goal.

3. A school/village anaerobic digester is also being considered with an investment of $7.5 million dollars utilizing municipal and local source separated solids. The A/D system would poduce 231,000+ therms of natural gas and get us to 309% of the goal.

The appendix lists the savings and results of the items selected.

Narrative – Potential Renewable Feedstocks

The Osceola Schools funded a study in Spring of 2008 that gives a more in depth analysis of several of the following items. That 42 page study is available at www.osceola.k12.wi.us and log onto Go Green.

What follows is a short synopsis of potential for each item:

- Wind - limited potential within the village because of height restriction due to an existing airport and location of the village within a river valley. There may be viable locations within the school district for wind generation. A long term study would be needed to justify any large scale investment.
- Solar - various solar heating possibilities were explored in the report. Extended payback time for uses other than solar hot water makes for reduced viability.
- Biogas (landfill, agriculturally-based) - a great deal of potential exists for feedstocks for an anaerobic digester. A more detailed study would need to be done to estimate potential energy production.
- Biomass (wood, prairie grasses, other) - great potential exists with considerable agricultural production in the area
- Hydro - not feasible economically to harness energy from wastewater treatment plant or waterfall with microturbines. The St. Croix River already has a hydro-electric dam located seven miles upstream so there isn't any potential there.
- Other - None

Existing Unknowns – Necessary Information for Future

- Drill wells for geothermal system to have a better understanding of energy transfer potential within the earth
- Study of feedstock availability for a village/school operated anaerobic digester
- More complete information on wind and solar energy production feasibility for electricity production.
- Community wide energy usage for a 100% sustainable community for food and fuel with this exercise as a starting point.
- The Osceola Schools will be considering a multimillion dollar referendum for energy saving investments and will then invest savings in the general operating fund. That will require more specific costs, savings, and paybacks on all items mentioned. It would be nice to have additional state resources available for implementation of action items identified and for community outreach efforts for educational purposes.

Action Steps – Immediate & Long - Term

- Turn down thermostats in school buildings- completed during 2009
- Continue to replace light bulbs, lamps and computer controls- ongoing as bulbs need replacing
- Replace middle school A/C unit - summer maintenance item 2010
- Do a study with test wells for geothermal systems - Spring 2010
- Research feedstocks for anaerobic digester - if funding becomes available, 2010
- Joint Village/School Board meeting in January 2010 to discuss findings and next steps
- Host a community event to discuss 100% sustainable community with Natural Step participants- late winter or early spring 2010
- Finalize the plan on December 18th - completed

Energy Independence Team Members

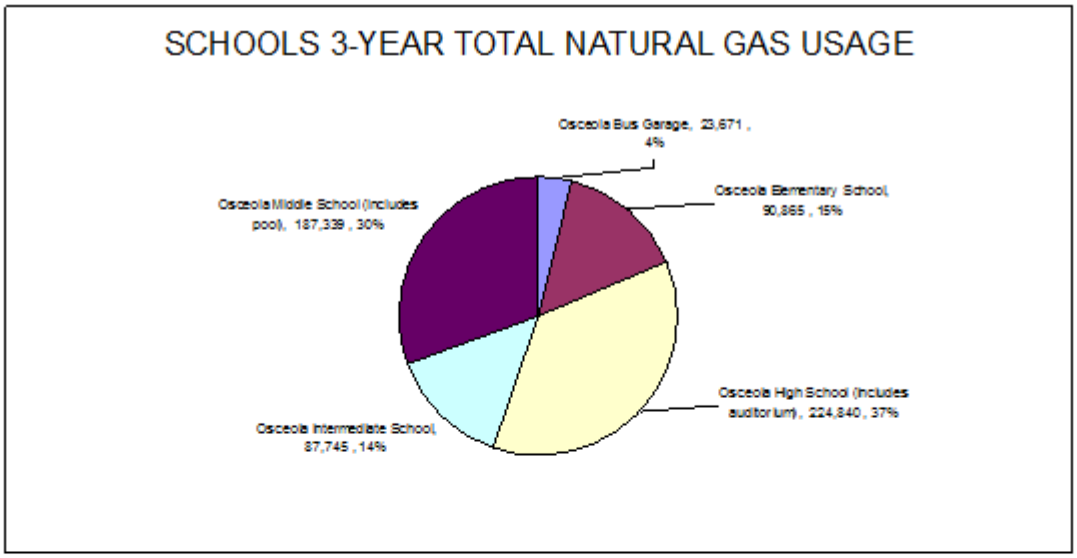
- Neil Soltis- Village of Osceola Administrator
- Jim Schmidt- Village Grounds & Operations Manager
- Roger Kumlien- Osceola School Superintendent
- Bob Schmidt- School Grounds and Maintenance Supervisor
- Pete Kammerud- School District Fleet Supervisor
- Holly Walsh- Community Representative & TNS Member
- Kelly Cain- UW RF SCISCD Director
- Trudy Popenhagen- XCEL Energy
- Nathan Deprey- Osceola Public Library
- Bob Kazmierski- Polk Co. UW CNRED EX Agent
- Douglas B. Johnson- Environmental Intelligence Inc., St Paul, Mn. and a volunteer for the project
- Wally Pisczek- Village Trustee
- Timm Johnson- Energy Coordinator

Appendix – Baseline Energy Consumption Data – Spreadsheets

Appendix A: Baseline Use and Targeted Goal

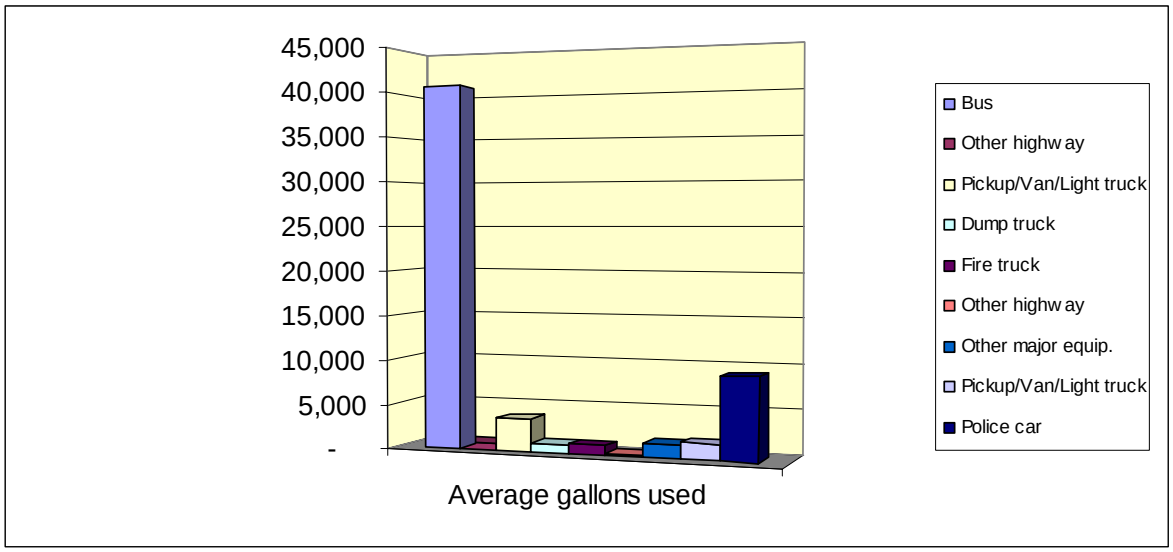
Your 2008 energy usage baseline is	42,624	million (MM) Btus.
That baseline is comprised of	3,990,644	kWh,
	214,800	therms,
	16,716	gallons of gasoline,
and	39,247	gallons of diesel.
By assuming an annual growth rate of	1.00%	,
in 2025 your energy use baseline will be	50,480	MMBtu.
Your 25% energy reduction goal		
for 2025 is therefore	12,620	MMBtu,
or	30%	of your 2008 consumption.
This translates into	3,698,712	kWh or
	126,200	therms or
	101,774	gallons gas or
	90,791	gallons diesel or
		some combination
		of those fuels.

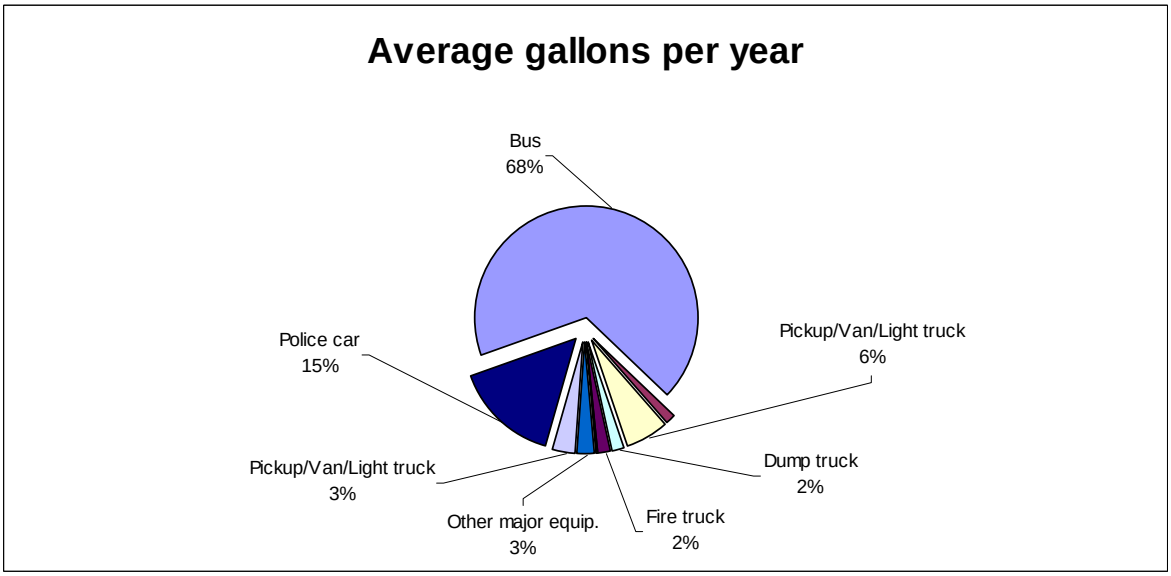
Appendix B: School Natural Gas Use



Building name/purpose	Sum of 2006 total	Sum of 2007 total	Sum of 2008 total	Sum of 3-year total	BTU/Sq Ft.
Osceola Bus Garage	6,751	8,352	8,568	23,671	0.476
Osceola Elementary School	30,328	28,687	31,850	90,865	0.398
Osceola High School (Includes auditorium)	67,083	77,970	79,787	224,840	0.457
Osceola Intermediate School	28,010	28,837	30,898	87,745	0.363
Osceola Middle School (Includes pool)	65,354	58,288	63,697	187,339	0.616
Grand Total	197,526	202,134	214,800	614,460	

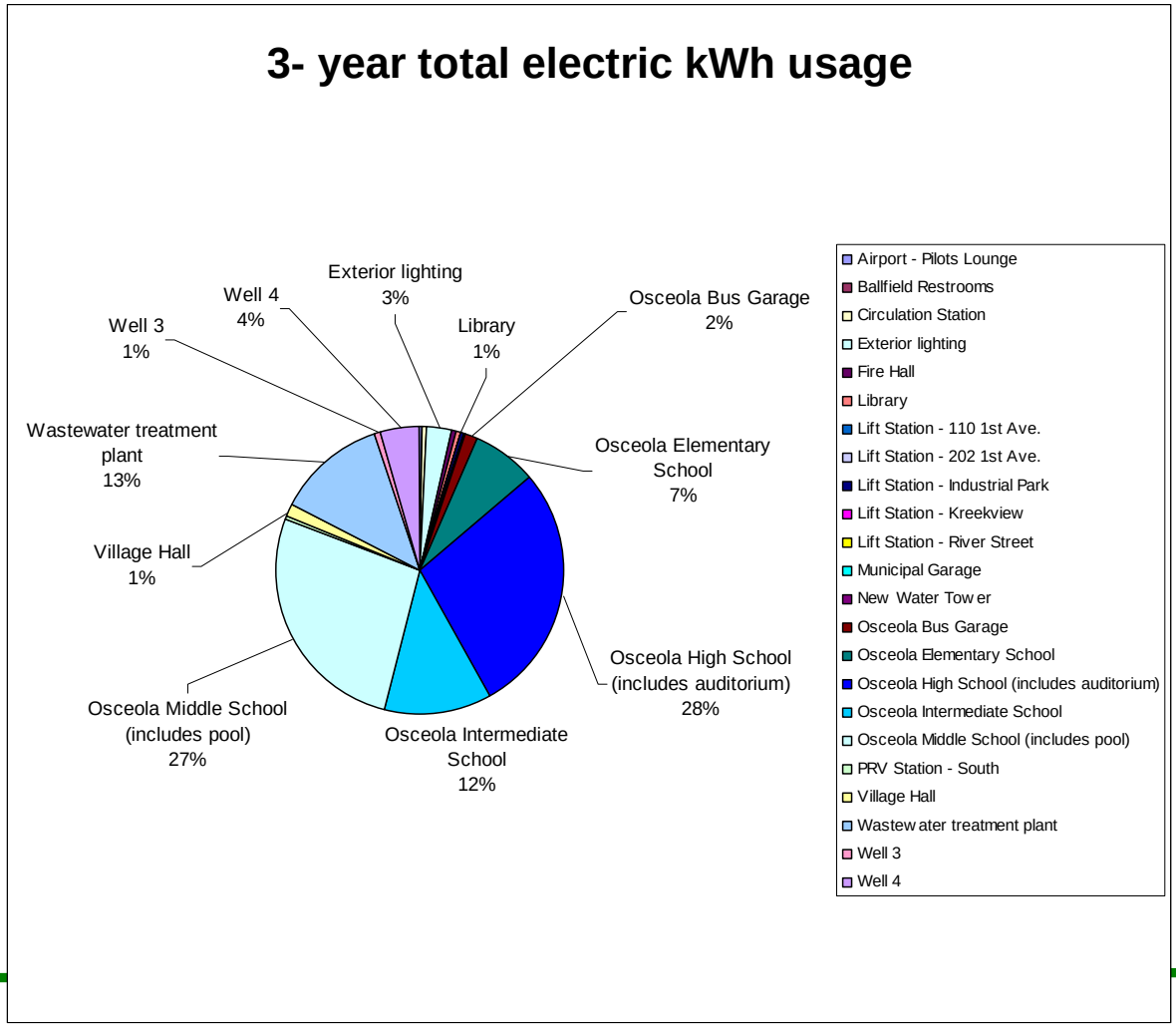
Appendix C: Village and School Liquid Fuel Usage





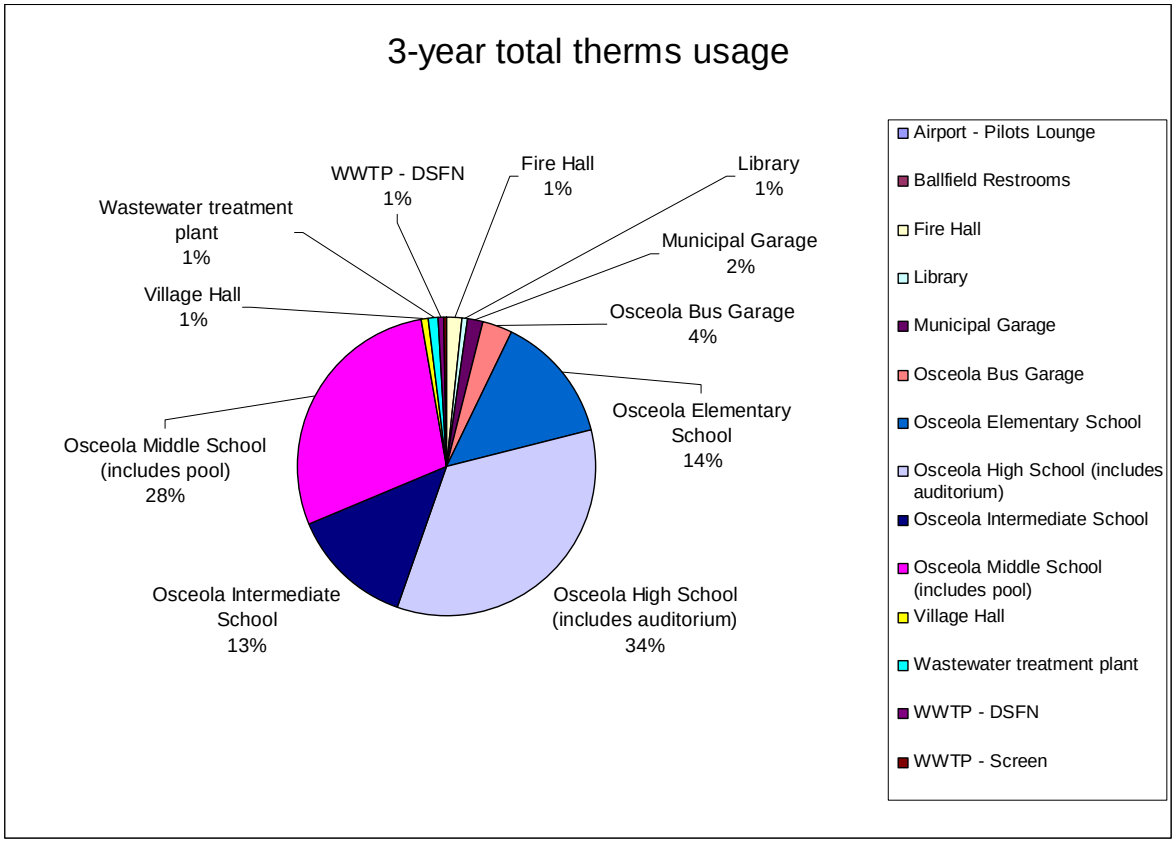
Appendix D: 3 Year Electric Use

Building name/purpose	2006 total	2007 total	2008 total	3- year total	% of total
Airport - Pilots Lounge	11,811	10,367	9,870	32,048	0%
Ballfield Restrooms	1,290	2,041	1,818	5,149	0%
Circulation Station	17,172	20,070	20,646	57,888	0%
Exterior lighting	81,944	130,993	131,047	343,984	3%
Fire Hall	15,352	15,765	16,885	48,002	0%
Library	28,713	29,919	26,403	85,035	1%
Lift Station - 110 1st Ave.	535	-	-	535	0%
Lift Station - 202 1st Ave.	-	1,919	1,182	3,101	0%
Lift Station - Industrial Park	4,949	5,387	8,285	18,621	0%
Lift Station - Kreekview	731	791	1,027	2,549	0%
Lift Station - River Street	575	702	658	1,935	0%
Municipal Garage	7,434	6,902	8,899	23,235	0%
New Water Tower	2,577	2,654	3,485	8,716	0%
Osceola Bus Garage	58,800	63,400	64,160	186,360	2%
Osceola Elementary School	303,677	277,842	276,020	857,539	7%
Osceola High School (includes auditorium)	1,182,400	1,095,800	1,087,000	3,365,200	28%
Osceola Intermediate School	498,000	486,000	449,600	1,433,600	12%
Osceola Middle School (includes pool)	1,112,500	1,061,600	1,077,600	3,251,700	27%
PRV Station - South	10,012	11,833	9,551	31,396	0%
Village Hall	45,660	47,932	46,472	140,064	1%
Wastewater treatment plant	486,240	496,464	541,770	1,524,474	13%
Well 3	32,428	17,563	17,786	67,777	1%
Well 4	154,880	177,200	190,480	522,560	4%
Grand Total	**4,057,680**	**3,963,144**	**3,990,644**	**12,011,468**	**100%**

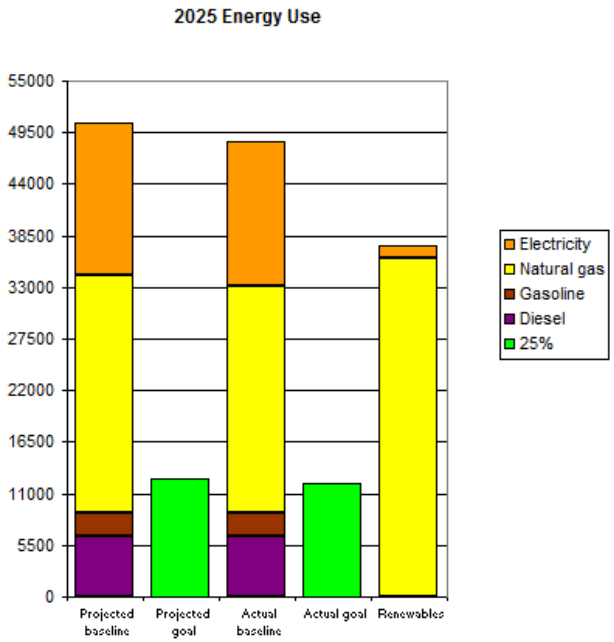


Appendix E: 3 Year Natural Gas Use

Building name/purpose	Sum of 2006 total	Sum of 2007 total	Sum of 2008 total	Sum of 3-year total	% of total
Airport - Pilots Lounge	143	293	361	797	0%
Ballfield Restrooms	-	-	-	-	0%
Fire Hall	2,758	2,805	3,988	9,551	1%
Library	1,072	1,001	1,618	3,691	1%
Municipal Garage	2,992	3,217	4,462	10,671	2%
Osceola Bus Garage	6,751	8,352	8,568	23,671	4%
Osceola Elementary School	30,328	28,687	31,850	90,865	14%
Osceola High School (includes auditorium)	67,083	77,970	79,787	224,840	34%
Osceola Intermediate School	28,010	28,837	30,898	87,745	13%
Osceola Middle School (includes pool)	65,354	58,288	63,697	187,339	28%
Village Hall	2,029	2,166	2,298	6,493	1%
Wastewater treatment plant	2,003	2,356	2,670	7,029	1%
WWTP - DSFN	957	1,260	1,177	3,394	1%
WWTP - Screen	1,478	10	43	1,531	0%
Grand Total	210,958	215,242	231,417	657,617	100%



2009 Wisconsin Energy Independent Community Partnership



Percent of 25% goal achieved: 309%

Measures

		Name	Savings-to-investment ratio	Savings	Installed cost before incentives	Incentive amounts	Present value cost with incentives	lbs CO2
10%	R	Wisconsin RPS	--	1467 kWh	--	--	--	2,481
0	R	Purchased renewable electricity	#DIV/0!	0 kWh	$ -	--	$ -	-
On	R	Installation of solar panels and thermal blankets	0.92	4000 therms	$ 215,000.00	$ 57,000.00	$ 158,000.00	46,832
On	E	Middle School A/C Unit	0.32	25000 kWh	$ 80,000.00	$ -	$ 80,000.00	42,300
On	E	Lighting control in school buildings and grounds	5.39	189000 kWh	$ 36,192.00	$ -	$ 35,982.09	319,788
On	R	Geothermal heating and cooling	1857779.00	125000 therms	$ 1,680,000.00	$ -	$ -	1,463,500
On	E	Temperature setting in 4 school buildings	#N/A	12200 therms	$ 1.00	$ -	#N/A	142,838
On	R	Anaerobic digester	0.39	231417 therms	$ 7,500,000.00	$ -	$ 6,862,500.00	2,709,430
On								
				Total:	$ 9,511,193.00	$ 57,000.00	#N/A	4,727,169

Baseline lbs CO2:	10,471,634
New lbs CO2:	5,744,465
Reduction:	45%

Appendix F:
ECW Tool
For Meeting
25% Goal

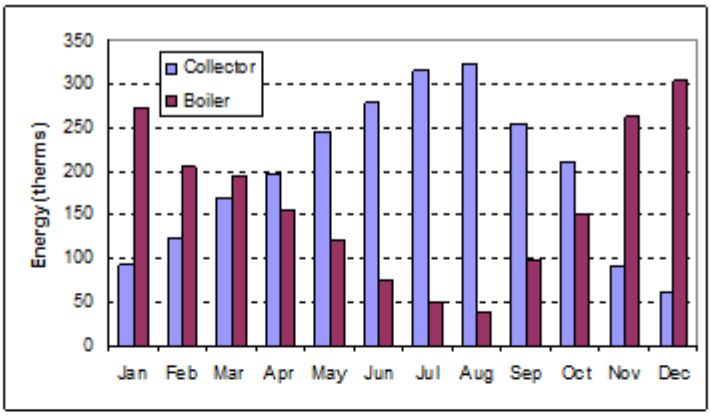
Appendix G: School Solar Collectors & Thermal Blankets

Osceola Pool Solar Panels & Blankets

- 32 Panel *Solar Skies* glycol-based closed drain back system
- Heat exchangers transfer heat to hot tub, wading pool, lap pool and domestic hot water
- Thermal blankets cover each pool
- Cost of solar panels was $155,000 with a $47,000 FOE grant
- Cost of thermal blankets $70,000 with a $10,000 FOE grant

Energy Use in the Pool

- Energy Center of Wisconsin model predicts 6,750 therms of energy needed for the pool complex
- Solar panels are producing 4,000 therms historically
- Blankets are predicted to save 2,445 therms
- 6,500 therms saved equal about $32,500 annually
- Total cost should be paid for in 5-6 years
- Additional savings from the blankets:
  - Reduced evaporation of 20,000 to 25,000 gallons a month
  - Reduced chemical usage
  - Reduced dehumidifier operations
  - Reduced energy needed for domestic hot water
  - Expected surface area benefit in the pool area due to less chemical evaporation and humidity



	With Cover		
	Collector	**Boiler**	**Load**
	therms	therms	therms
Jan	93.10	272.60	365.70
Feb	124.70	205.60	330.30
Mar	170.00	195.70	365.70
Apr	197.40	156.50	353.90
May	245.00	120.70	365.70
Jun	278.10	75.90	354.00
Jul	316.80	48.90	365.70
Aug	325.20	40.50	365.70
Sep	254.10	99.80	353.90
Oct	212.50	153.20	365.70
Nov	90.70	263.30	354.00
Dec	61.50	304.20	365.70
Annual	**2369.10**	**1936.90**	**4306.00**

Please direct any questions electronically to:

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