

# Energy Savings Progress

Woodbine & West Union Main Street Districts



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Woodbine and West Union, designated as Main Street Iowa communities by the Iowa Economic Development Authority (IEDA), were selected in 2008 as Green Pilot Communities to become models of sustainable practices integrated into Main Street district revitalization. Part of this initiative focused on making energy efficiency improvements to the historic commercial buildings.

The local Main Street programs, in partnership with the city, utilities, consultants, and contractors have been the catalyst for assisting downtown property owners in this project. A variety of financial incentives were used to help the property owners receive audits and make improvements.

This report highlights analysis performed by The Energy Group, a firm under contract by the IEDA. This firm examined specific building energy savings for five case study properties in each district. This report focuses on the outcomes of improvements made between January 2009 and August 2010, although energy improvements continued after that timeframe. The analysis relied on utility data to measure the post-retrofit energy use of many of the buildings. Modeling was also used to provide a baseline of energy use for properties that had new occupancy uses post-retrofit. It also provides details of energy efficiency strategies implemented that have led to significant energy savings for businesses, resulting in a reduction of overhead costs and improving their bottom line. These strategies can be implemented in historic commercial buildings all across Iowa. The approaches in the two communities have varied greatly to help demonstrate the lessons learned as they began their journey in developing sustainable Main Street districts.

## WOODBINE, IOWA

Located in Harrison County in western Iowa, Woodbine is a city with a population of 1,564 residents and became a designated Main Street community in 2008. Woodbine is served by municipal electric and gas utilities. In 2009 Woodbine Municipal Utilities began offering comprehensive energy audits to 49 downtown businesses, 45 of which received energy audits. Several of the buildings in Woodbine undertook extensive rehabilitation, and deep energy retrofits were seamlessly integrated. Nine buildings made energy efficiency improvements as of August 2010. Some buildings are already proving to be 30% more efficient!



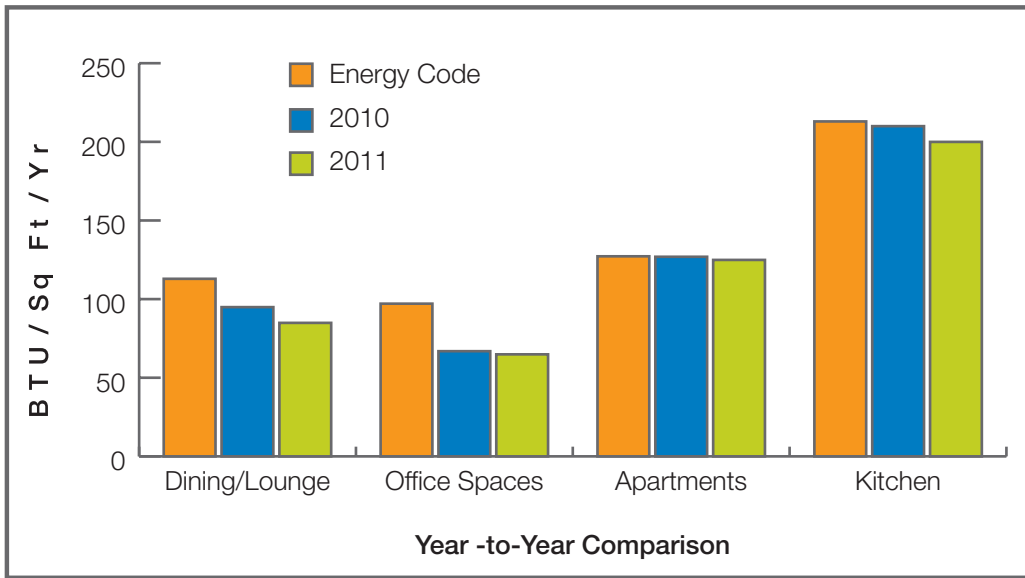
# Five Building Case Studies in Woodbine

## Whitmore Building - Woodbine, Iowa

This three-bay commercial building now houses office space, six upper-story apartments and one efficiency unit on the ground floor behind the Bunkhouse Restaurant. The previously underutilized building was completely rehabilitated in 2010. The tightening of the envelope included spray foam insulation in the basement, walls, and attic spaces. All Energy Star appliances, T-8 lighting systems, compact fluorescent lamps (CFL's), and a highly efficient geothermal heating and cooling system were installed.

Figure 1 demonstrates how the Whitmore building's 2010 and 2011 energy use compares to a baseline, newly constructed building with the same types of tenants and in compliance with the 2009 International Energy Conservation Code.

**Fig.1 Whitmore Building Energy Use vs. Similar Code Compliant Building**



**NOTE 1:** Baseline energy code information is based upon ASHRAE HVAC Applications Handbook because most of the spaces were vacant or underutilized before rehabilitation and energy efficiency improvements took place.

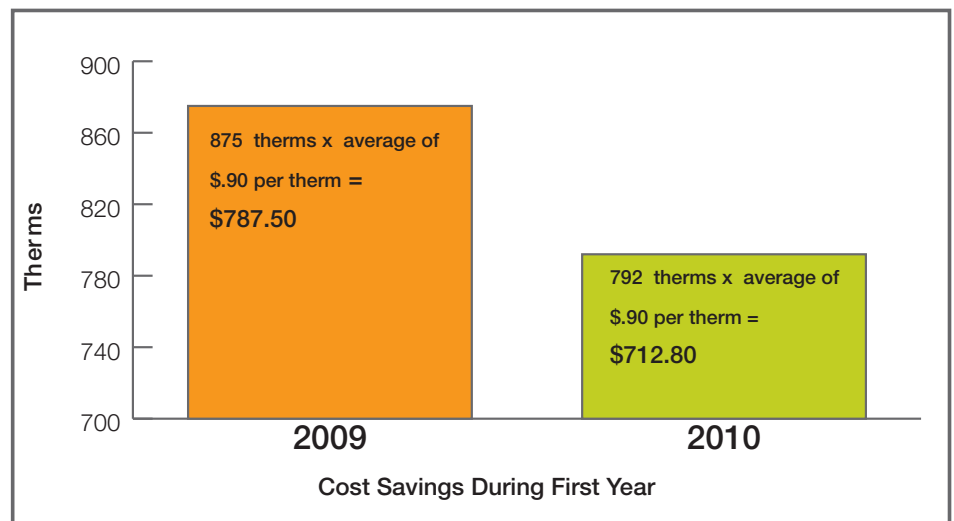
**NOTE 2:** 2011 is based upon actual energy bills obtained from utility provider. Tenants were beginning to occupy the building close to the timeframe of energy data collection, and it is predicted that the actual energy savings will prove to be much more significant if energy use is tracked over a period of one year after occupancy.

## Hometown Hardware - Woodbine, Iowa

A new 90%+ efficient furnace replaced a very inefficient hot water boiler. New sheet metal ductwork is creating efficient air distribution and return air for this property. It should be noted that these improvements improved the comfort in this building greatly and as a result, likely impacted indoor air quality in a positive way. Figure 2 illustrates the estimated impact of the new furnace in the initial year of operation.

**NOTE 1:** It is projected that energy savings will likely exceed the estimated impact noted above after the new unit has been operational for a full heating season. Current usage shows energy savings at approximately 10%.

**Fig.2 Hometown Hardware Annual Gas Savings Before and After Energy Improvements**



### **Nustyle Building - Woodbine, Iowa**

NuStyle Development owns and occupies this rehabilitated historic structure, which was originally a blacksmith operation. The heavy plank flooring and open face brick walls were kept to maintain the historic character of the structure. R-19 spray foam was blown onto the basement walls and ceiling joists to increase the heating and cooling efficiency of the HVAC system. Spray foam is not always the appropriate choice for every historic building application, but for the NuStyle building, it is a discreet yet effective energy efficiency improvement.

### **Benefits of Spray Foam in the NuStyle Building**

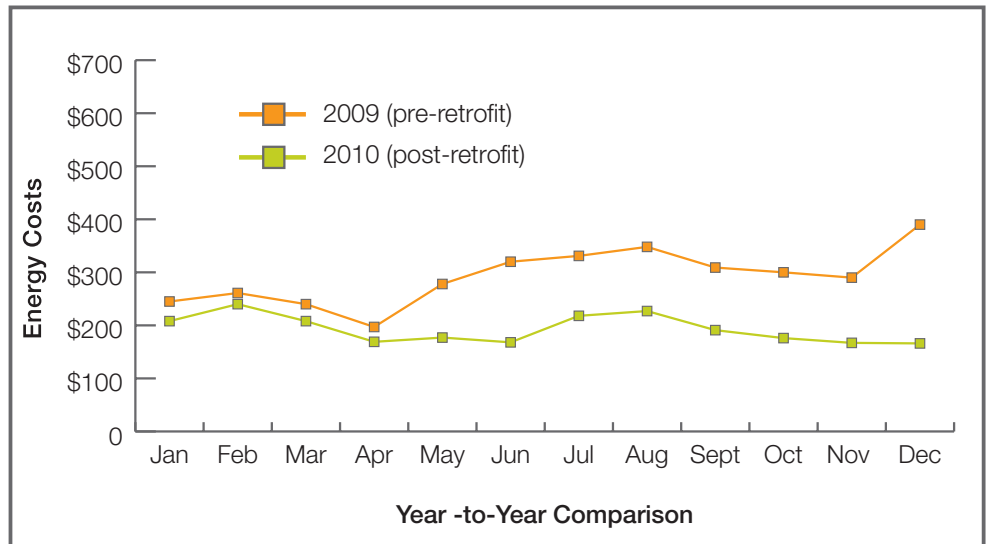


- The cost will pay for itself with energy savings in year 3
- Humidity and mold growth is reduced, and the damp smell is gone
- Owners no longer have to dehumidify the basement
- Air quality is improved
- Basement can now be used for archival file storage

### **Everything Ellen - Woodbine, Iowa**

Everything Ellen replaced an old steam boiler and radiator system with a high efficiency furnace and central air conditioning system along with a new sheet metal air distribution system (duct work). Window repairs were also made, in addition to insulation in the basement and in between floors. Fig.3 below shows a monthly comparison of Everything Ellen energy use before and after the modifications were made.

**Fig.3 Everything Ellen Monthly Energy Costs**



## Woodbine Antiques - Woodbine, Iowa

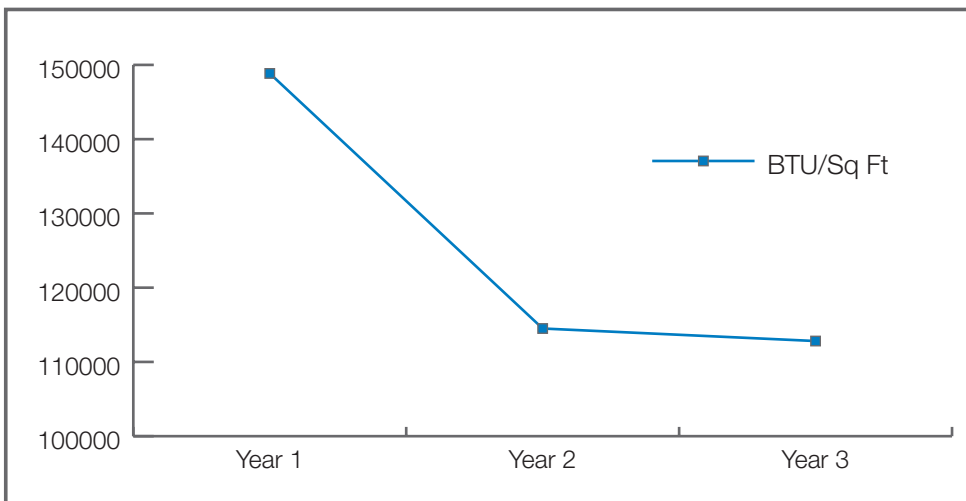
This formerly vacant property operates as an antique shop with a small coffee shop and diner in the rear of the building. New glass replaced cracked windows. A new door and retractable awning were installed. A 90%+ forced-air furnace, central air conditioning, and spray foam insulation in the basement improved heating and cooling efficiency. The overall energy consumption at this property is approximately 18% lower than it would have been previously, as shown in Figure 4.

**Fig.4 Pre-Retrofit Energy Usage: 96,600 BTU / Sq Ft / Yr  
Post-Retrofit Energy Usage: 67,200 BTU / Sq Ft / Yr**



## Cumulative Energy Savings Woodbine, Iowa

**Fig.5 Combined Energy Savings from Five Case Study Buildings**



The efficiency gains made in the five case study buildings resulted in the equivalency of:

- 25% less energy used in Year 3 in comparison to the baseline
- Annual greenhouse gas emissions equivalent to 11.0 passenger vehicles
- Greenhouse gas emissions from 199 barrels of oil consumed

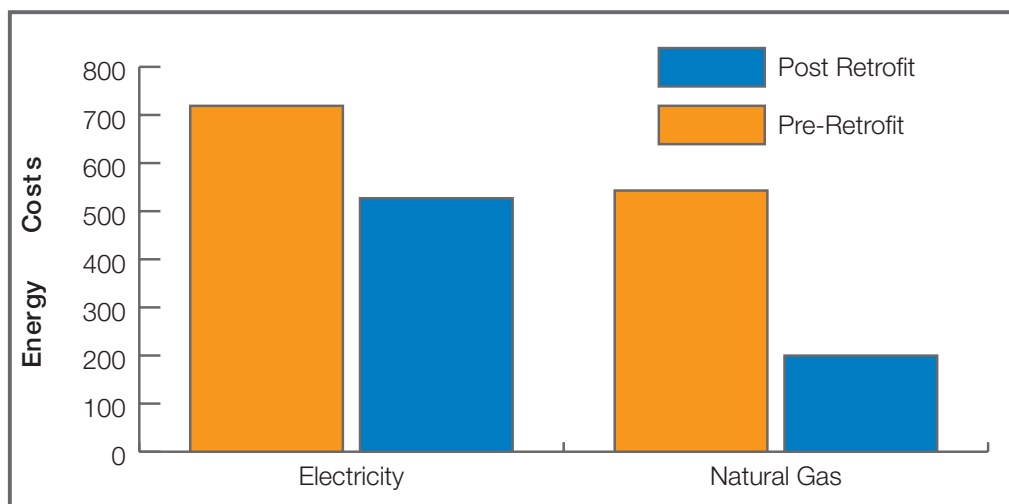
## WEST UNION, IOWA

Located in Fayette County in northeast Iowa, West Union is a city with a population of 2,549 and became a designated Main Street community in 2006. West Union is served by Alliant Energy for electric and Black Hills Energy for natural gas. West Union has been in the process of planning and implementing a district geothermal system that will be available to 60 downtown buildings, with plans for extension beyond the downtown. Downtown buildings made initial energy efficiency improvements based on audits provided by their utility in 2008 and 2009. In West Union, 76 buildings took advantage of energy audits offered by their utility and 25 buildings made improvements as of August 2010. However, in-depth analysis will be taking place on how specific energy efficiency improvements can be made in order to most cost-effectively connect to the district geothermal system.



## Five Building Case Studies in West Union

**Fig.6 Chamber of Commerce Anticipated Annual Energy Costs (Modeled)**



**Note:** This graph's energy savings is calculated using an assumption of tying into the district geothermal system in conjunction with the other improvements, which is anticipated to result in a 43% lower energy costs..

### ***Chamber of Commerce - West Union, Iowa***

The leadership demonstrated by the Chamber of Commerce and one of its tenants, Main Street West Union, led to plans to connect to the community district geothermal heating and cooling system. The organization decided to have their building receive a comprehensive energy audit to fully understand the potential savings. The building has been tightened by installing R-11 wall insulation. There are plans to install a vegetative green roof system as well, which will assist in cooling the building. The order of installation of the measures was appropriate, as it will greatly aid in the proper sizing of the geothermal unit.

### **First National Bank - West Union, Iowa**

The energy analysis conducted at the bank indicated they could benefit greatly from the installation of new T-8 lamps and electronic ballast to replace the original T-12 lighting lamps and magnetic ballasts, which are common in offices and commercial buildings, but not as energy efficient. A rebate from Alliant Energy aided in the payment of the retrofit, resulting in a project payback period just over three years as described in Figure 7.

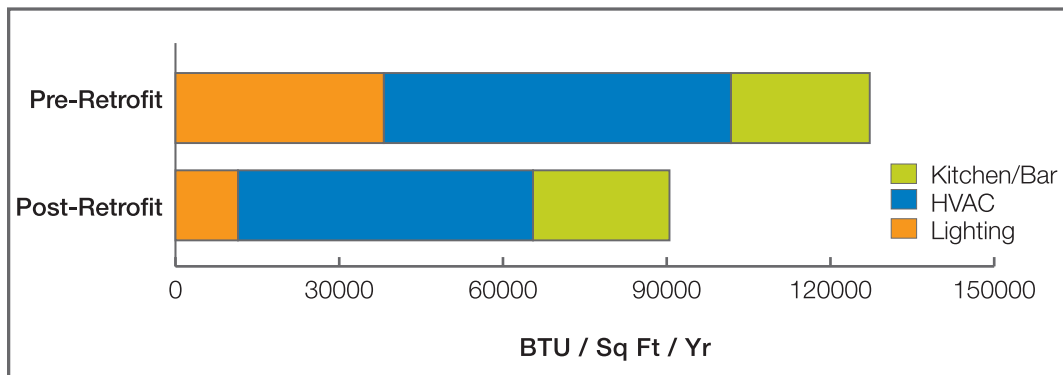
**Fig.7 First National Bank Lighting Project Return on Investment**

**Cost of Improvements: \$3,951.00**  
**Energy Savings: \$1,274.52 per year**  
**Simple Payback: 3.1 Years**

### **Tap't Out Stein-N-Dine - West Union, Iowa**

New energy efficient lighting, new central air conditioning, a new Energy Star rated fryer and a bottle cooler demonstrate the efficiency improvement made to this restaurant and lounge. Due to the nature of the operation of a restaurant/lounge, the building is very energy intensive. However, the new lighting, A/C, fryer, and bottle cooler changed the energy profile significantly.

**Fig. 8 Tap't Out Stein-N-Dine Annual Energy Use**



### **Burnham-Wood Funeral Home - West Union, Iowa**

The funeral home replaced an old hot water boiler (approx. 70% efficient) with a new 85% efficient hot water boiler, resulting in the attractive payback displayed in Figure 9.

**Fig. 9 Burnham-Wood Funeral Home Boiler Project Return on Investment**

**Cost of Improvements: \$8,500.00**  
**Energy Savings: \$1,634.52 per year**  
**Simple Payback: 5.2 Years**

## Fayette County Courthouse - West Union, Iowa

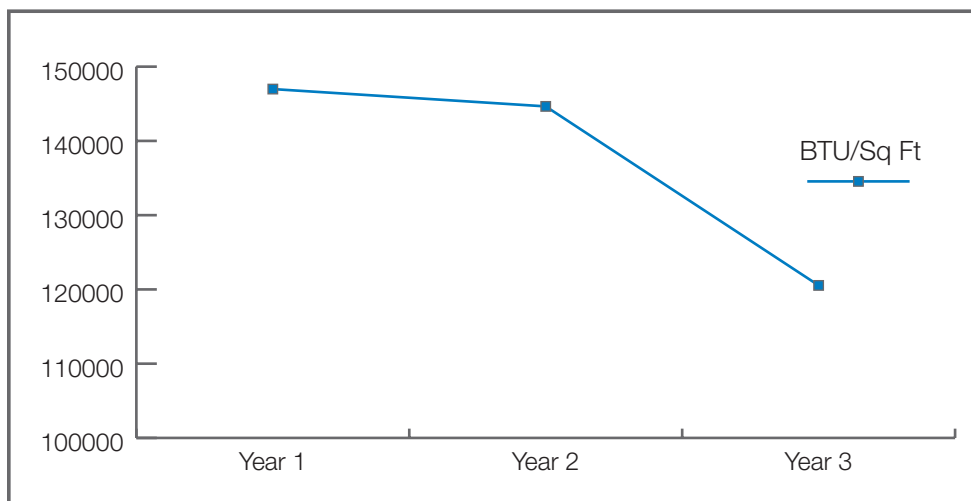
The Fayette County Board of Supervisors installed all new energy efficient lighting as a result of an energy analysis supported by Alliant Energy and the State of Iowa. The before and after energy use impacts are shown in Figure 10.

**Fig. 10 Fayette County Courthouse Lighting Energy Use Before and After Retrofit**

	Before		After	
	Kwh (kilowatt hour)	Cost	Kwh (kilowatt hour)	Cost
January	11,900	\$952.00	8,330	\$666.40
February	12,400	\$992.00	8,680	\$694.40
March	12,160	\$972.80	8,512	\$680.96
April	12,420	\$993.60	8,694	\$695.52
May	10,880	\$870.40	7,616	\$609.28
June	16,160	\$1,292.80	11,312	\$904.96
July	14,360	\$1,148.80	10,052	\$804.16
August	23,200	\$1,856.00	16,240	\$1,299.20
September	16,800	\$1,344.00	11,760	\$940.80
October	14,500	\$1,160.00	10,150	\$812.00
November	12,500	\$1,000.00	8,750	\$700.00
December	12,400	\$992.00	8,680	\$694.40
<b>TOTAL SAVINGS \$4,072.32</b>				

## Cumulative Energy Savings West Union, Iowa

**Fig. 11 Combined Energy Savings from Five Case Study Buildings**



The efficiency gains made in the five case study buildings resulted in the equivalency of:

- 18% less energy used in Year 3 in comparison to the baseline
- Annual greenhouse gas emissions equivalent to 19.5 passenger vehicles
- Greenhouse gas emissions from 363 barrels of oil consumed

## Conclusion

Woodbine and West Union are experiencing the benefits of downtown revitalization in concert with a variety of sustainable practices including energy efficiency. Existing businesses are saving money on overhead costs, which adds to their bottom line. Previously vacant or underutilized buildings that were rehabilitated with energy efficiency became more attractive to tenants and businesses, and are now increasing the economic and social value of the downtown. The benefits of making improvements to common downtown properties, like a bank and a county courthouse, can be realized and replicated across Iowa. For communities and local economic development organizations who haven't undertaken a downtown energy efficiency project, this demonstrates that energy efficiency is a key component in the downtown revitalization and small business development toolbox.

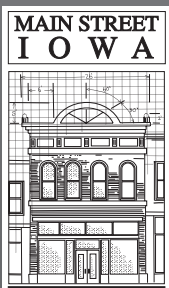
## Acknowledgements

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