EEP-2013-0001

FILED WITH
Executive Secretary

June 26, 2013

IOWA UTILITIES BOARD

Home Energy Plan

Customer's Name
Address St.
Decorah, IA
Date of Audit: Date

Winneshiek Energy District
217 W Water St.
563.380.7137
joel@energydistrict.org

Homeowner priorities/complaints/issues:

- Reducing energy costs (and impacts)
- Replacing old boiler
- Making cost-effective improvements

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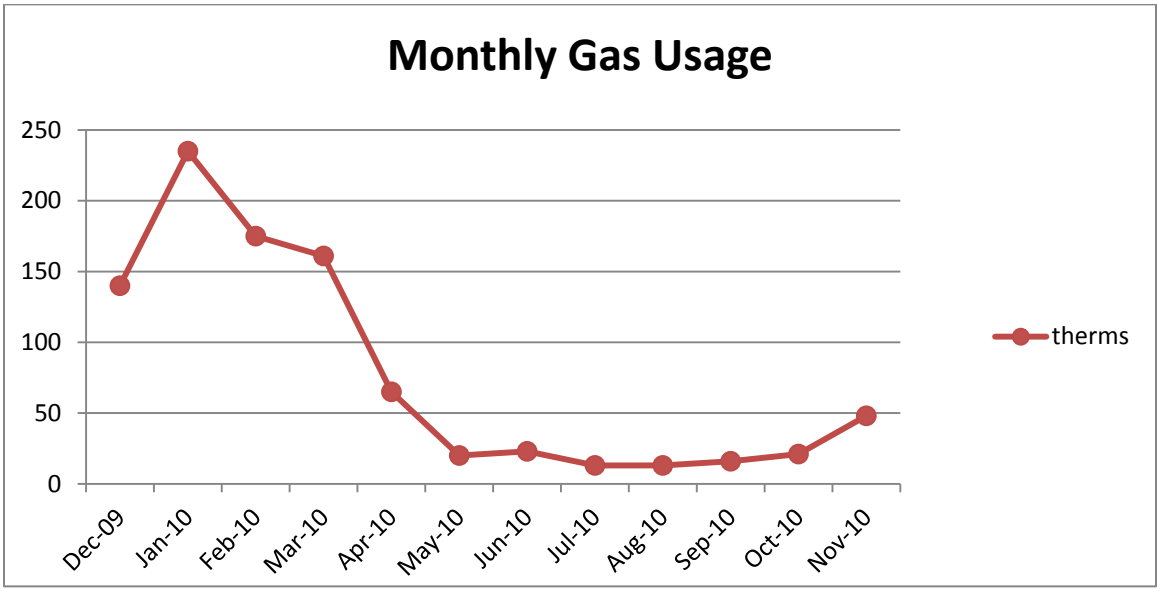
Energy Use Overview

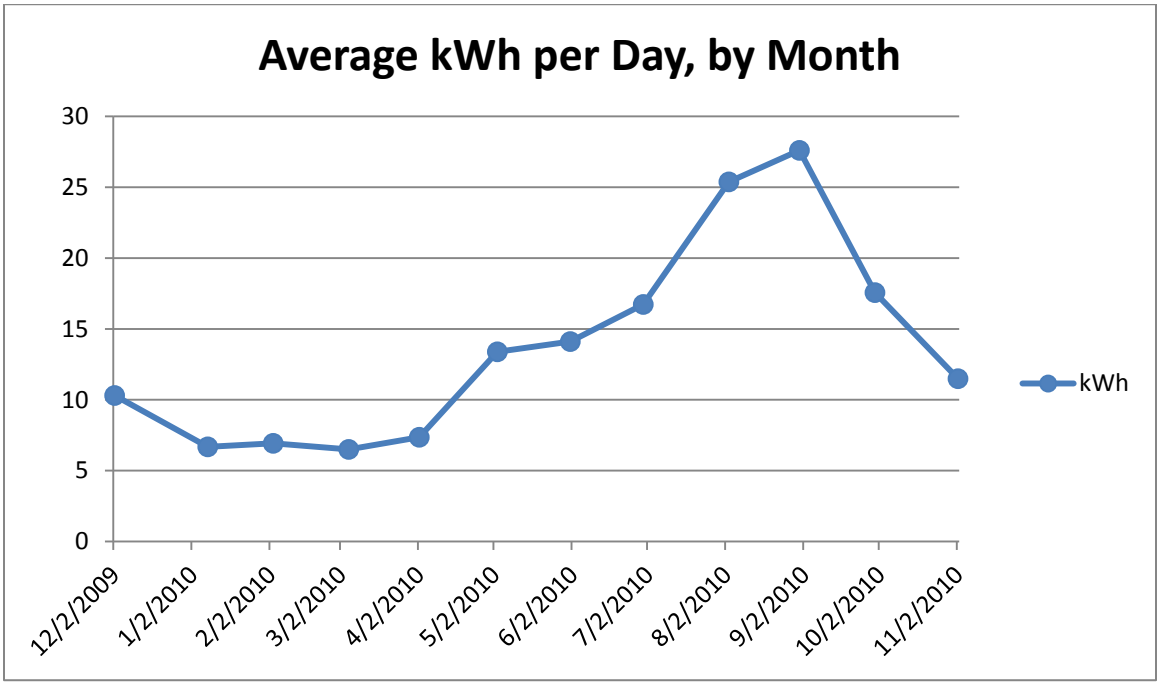
The charts below show how much natural gas and electricity you use each month. Understanding how your usage varies from month to month can help identify how much energy you are using seasonally (heating and cooling) and what you are using year-round (lights, appliances, hot water heating and plug load).



As you would expect, your gas usage is higher during the winter months due to heating loads. In addition to heating loads there is a gas "base load," the amount you use each month regardless of season used to heat water. You have a base load of 14 therms per month. I estimate that about 18% of your overall gas usage is for hot water heating usage with the rest used for space heating.

Total Annual gas usage: 930 therms; about $930

I have shown the average electric use per day rather than the overall monthly usage. The number of days between meter readings can vary greatly and make it difficult to compare usage from month to month. Showing this way makes it easier to understand how you use electricity.



Your electric usage is pretty low. A lot of families use around 20 kWh per day on average. You can see that your electric usage is very low in the spring and then increased over the summer. Air conditioning and increased dehumidifying typically account for higher summer usage.

Total Annual Electric Usage: 5019 kWh; $793.26

Your Energy Upgrade Plan

This plan can be revised after we talk. Below are my recommendations as a starting point.

- Seal off tops of walls open to lower storage attic
- Insulate lower attic floor to R-50
- Seal attic entry ways
- Pack vaulted ceilings?
- Replace boiler

While not on my immediate list of improvements, you should keep these projects in mind for down the road.

- Air seal laundry room
- Insulate/air seal vaulted ceiling
- Add rigid insulation over sloped portions of roof

Your main motivation in getting an energy audit was to determine whether or not it made sense to replace your boiler. While it does make sense to replace the boiler, I think there are a couple things to do that will prove fairly inexpensive and will more cost effective than a boiler replacement. The boiler is still cost-effective to replace, that should be done as well.

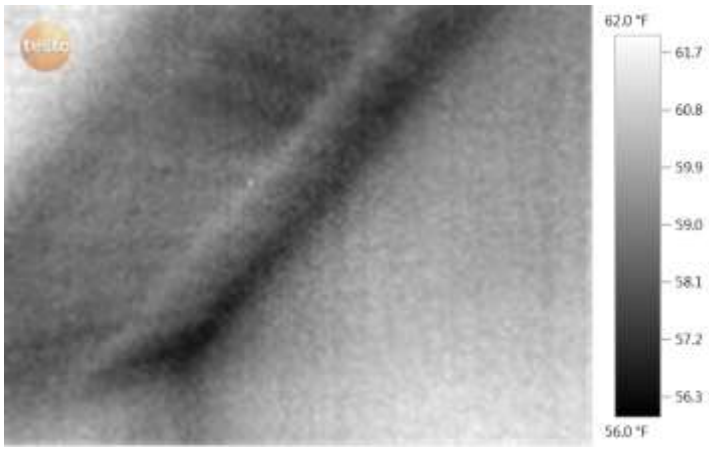
When I inspected the lower attic, I noticed that the wall separating the bathroom from the living room had no top plate and was open to the attic above. This can pull warm air out of the house into the attic. It's a pretty simple job to seal off the top of that wall to prevent this from happening. This should also be done on the west exterior wall of that section of the house. While the wall was insulated with packed cellulose air can still make its way through the insulation and draw heat out of the house.

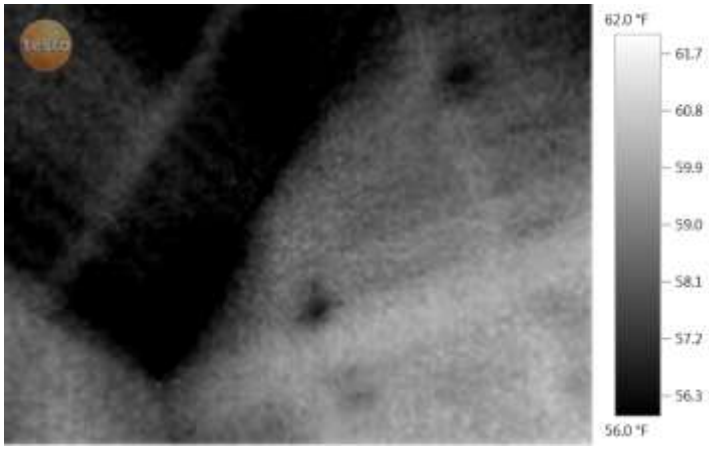
That attic had six inches of blown cellulose insulation on the attic floor, only providing an R-value of 20. I recommend insulating that area to R-50 with another 8-9" of blown cellulose. If you would like to keep that area useable as a storage space, I would remove the floorboards before adding 2x10s across the current joists and insulating the cavities. You can reuse the floorboards if you wish or use plywood for the new floor. I would also install new weather stripping to the door as the current stripping was starting to fall off in places.

There seemed to 12" of blown cellulose the back part of the house, although it was hard to tell exactly how consistent it was throughout since it was impossible to access. It looked pretty good though from what I was able to see by peeking in from the storage attic. 12 inches of cellulose provides an R-41 insulating value, which is high enough to leave alone and not bother to improve. For reference new, homes are required to have attics insulated to R-38 but many are insulated to R-50.

The upper attic is well insulated with over 13 inches of blown cellulose, except where the insulation slopes down to the attic hatch. Ideally you build a "dam" around the attic hatch that allows you to insulate a full 13 inches all the way to the edge of the hatch. You could do this when you add more insulation to the other attic. The main attic hatch was still leaky – even though there was foam striping around the edge. The cheap foam stripping doesn't hold out very well, I would try the v-strip weather stripping that typically lasts longer and makes a better seal. The hatch was insulated with rigid insulation, which is good.

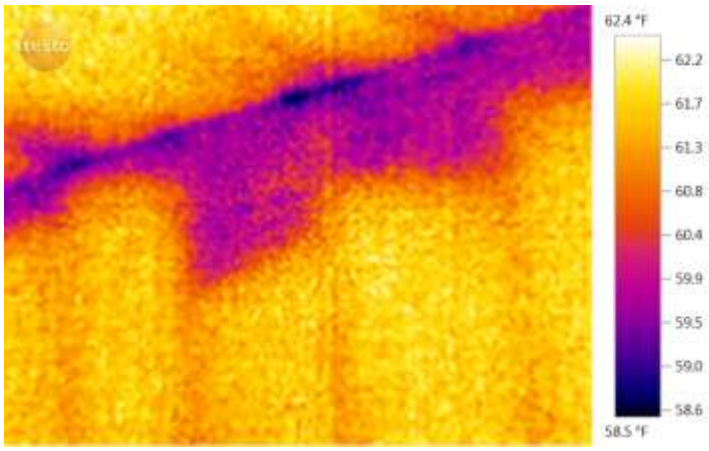
I didn't go into the attic that you reach though the kid's room. I am assuming though that there is a consistent 12" of insulation over the back of the house. However, that would be a good place to explore as there are several connections between the laundry room and its attic.





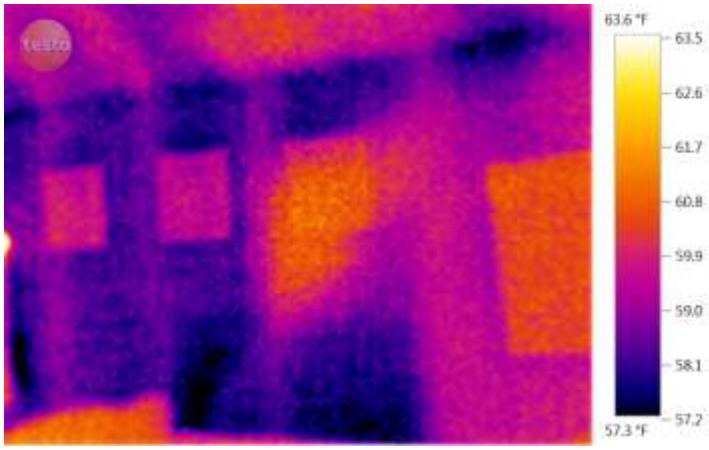
Vaulted ceilings appear to be completely uninsulated. As you can see from the thermal images above, the vaulted ceiling above the stair case is quite cold. The darker areas represent colder spots, while the warmer areas show up as white. The second image shows the same location when the blower door was running – cold air was sucked into the house from the attic. Insulating vaulted ceilings can be expensive, simply because they are more difficult to access.

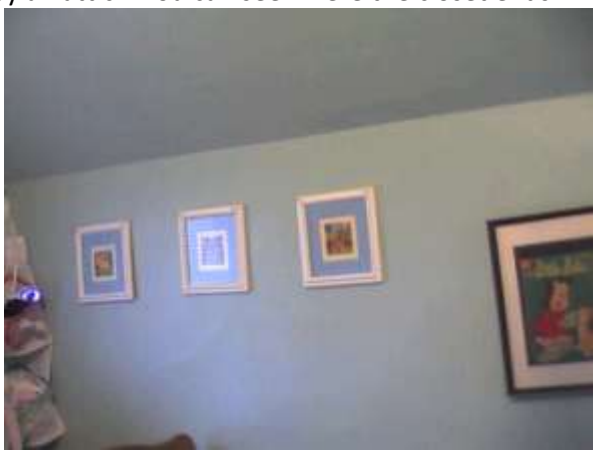
You said you treat the laundry room as outside, but that's not really a fair assessment since there is a radiator out there. It probably needs to be considered part of the house. The room needs to be sealed , there were more connections between it and the outdoors than between it and the interior of the house.



Most of the walls are insulated, mostly likely with loose blown cellulose. I could see that insulation was missing in some places, see the photo above, which proves that there is indeed insulation throughout most the rest of the wall. It is possible to fill in the places where insulation is missing, but it wouldn't really prove cost-effective. If you ever are considering residing I recommend adding rigid insulation to the exterior of the house. This would ensure you have continuous coverage of insulation across your whole wall and would eliminate thermal bridging across the studs in the wall.

You can see that the wall adjoining the attic in the kid's room is uninsulated. Sometimes I think people were mistaken about the need to insulate areas "sheltered by an attic." You can see where the closet ends.





You have had the basement rim joist insulated with spray foam. In addition much of the foundation is insulated on the exterior with rigid foam (see photo at left).

The spray foam is doing a very good job of air sealing in the basement. However, there was still a lot of air leakage from the crawlspaces, not entirely sure where since it is pretty inaccessible.

Your water heater is a fairy efficient water heater. You use very little gas for heating water. While it probably makes sense to install an indirect hot water heater when it is time to replace your current model, it

makes sense to hang on the one you have for as long as it continues to work. You spend less than $75 a year on hot water, even if a new water heater were to cut that in half you can see that it would take a very long time for the investment to pay itself back.

Evidently the manufactures of your boiler went out of business in 1971. Not that you should trust everything you find on the internet but that gives you some idea of how old the unit is. It's hard to measure efficiency on boilers that old but 65% efficient is probably being generous.

Make sure that the boiler bid for your home is appropriately sized. Oversized heating equipment is less efficient because it fires off and on, a process called short cycling. Heat is lost at the beginning and end of every heating cycle. Right sized equipment will burn less fuel for longer periods of time, wasting less heat at the beginning and end of each firing. In addition buying an oversized boiler will cost slightly more upfront: there's no need to pay for more heating capacity than you need. I think your house could be properly heated with a 50,000 Btu/hr boiler. Ask your heating contractor for details of how s/he sizes your system.

Economic Analysis

This table displays details of the improvements recommended for your home. Each improvement has several figures that show its projected impact:

- The Base column shows the current state, Improved, the state after improvement.
- Details about energy and CO2 savings.
- Financial Information A look at the cost, years to payback, and savings associated with each selected improvement.
- SIR – the Savings to Investment Ratio (SIR). This is a ratio of savings to total installed cost over the life of the practice. Improvements with a SIR greater than one will, over time, pay for themselves.
- MIRR – the Modified Internal Rate of Return. This can be thought of as the rate of return if the improvement cost were invested in an interest bearing account.

Improvements	Base	Improved	Energy Saved MBtu/Y	% Energy Saved	CO2 Saved M-T/Yr	% CO2 Saved	Save Year 1	Pay Back Yr	Net Cost	SIR w/o Loan w/ O&M	MIRR w/ Loan + O&M
Air seal	3050 CFM	2050 CFM	8.9	5%	0.5	3%	$82	6	$500	2.4	10%
Insulate attic	R=41.3	R=45.9	1.1	1%	0.1	0%	$10	10	$126	1.7	8%
Heating system	Eff.=61%	Eff.=93%	44.5	26%	3.0	18%	$374	11	$5,000	1.1	6%
Selected			54.5	32%	3.5	21%	$467	10	$5,626	1.3	6%

Note on the figures:

These figures are meant as a guide to show what improvements are the most cost effective and give estimates on savings and costs. Some measures may cost more or less than the estimated net cost, get bids from contactors to compare prices and check against projected savings. Note that as energy prices rise, improvements will be more valuable.

Note that the prices do not include the 30% match from the Energy District or additional rebates from Alliant and Black Hills. Information on utility rebates is provided in the appendix. All measures qualify for the 30% match. Not all measures need to be completed. Priority will be given to those most cost effective.

Available Rebates and Incentives

Available Rebates

Federal Tax Credit
Up to $500, through 2011
http://www.energystar.gov/index.cfm?c=tax_credits.tx_index

Home Energy Planning with Cost-Share Program from Winneshiek Energy District
30% of all costs up to $2000 per home. Can be paired with utility rebates.

Black Hills Energy

Boiler:	90% AFUE	$400
	85% to 89.9% AFUE	$150
Furnace/Boiler Maintenance:		Up to $30
*Ceiling Insulation ≥ R38		70% cost, up to $750
*Wall Insulation ≥ R11		70% cost, up to $750
*Air Sealing		70% cost, up to $200

Practices with an * require an energy audit from Black Hills (free)

Alliant Energy
Appliance Recycling Program: Alliant will properly dispose of your old working appliances for you, pick them up and your house AND pay you for it.

Freezers and refrigerators: $50
Window A/C units: $25

Renewables
Alliant Energy has a new incentive program for solar electric which is pretty generous. Also, there is a federal tax credit on all renewable systems for homes (solar electric, solar thermal, and wind). These can be used together to help pay for over half of the cost of solar electric systems.

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Practice	Timeline		Practice Complete (certified by Energy District)
	schedule work	work completed	
Seal off tops of walls open to lower storage attic			
Insulate lower attic floor to R-50			
Seal attic entry ways			
Pack vaulted ceilings?			
Replace boiler			

The above practices are eligible for a 30% cost share match, up to $2000, through the Winneshiek Energy District's Home Energy Planning program. The practices laid out in this plan are eligible for cost-share and represent a mutually agreed upon plan of action between the homeowner and Winneshiek Energy District. The plan should be finalized and all practices should be scheduled/bid within two weeks upon receiving the Home Energy Plan, and complete within ten weeks. The homeowner must notify Winneshiek Energy District if their intentions to implement the plan change. The grant-based timeline set out in this plan may be extended only after consultation with Winneshiek Energy District. The homeowner is responsible for contacting contractors and arranging work.

I have read and agree to the above statement.

Home Owner name: _____

Signature: _____ _____ Date: _____

Post Install Certification

Meets minimum ventilation requirements	
Meets minimum combustion safety requirements	

Energy Planner: Joel Zook Signature: _____ Date: _____
I certify that all the above practices have been correctly installed and are functional and are eligible for Cost-Share