

# Practical Biomass Energy Requires Boilers Designed for Fuels Not Fuels Designed for Boilers

## Conclusion

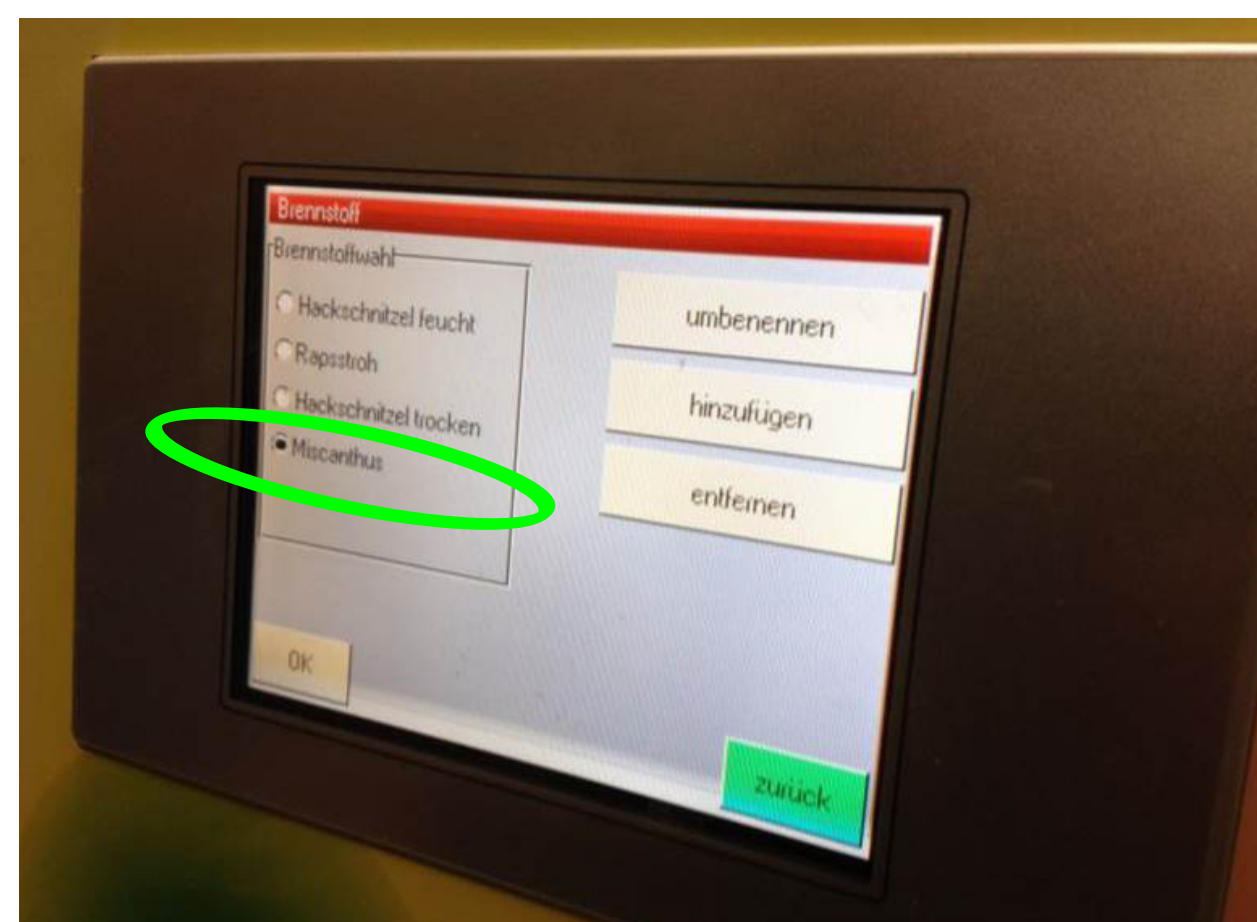
With the proper equipment now becoming available, cheaper, non-pelletized, non-processed forms of biomass like miscanthus chips, wood chips, grasses, and straw can be used as fuel. These boilers make it practical for those using moderate to large quantities of LP gas to reduce their fuel costs by 50%, while greatly reducing net carbon emissions. In most situations this biomass can be produced locally, on poorer soils and in ways that benefit wildlife, reduce nutrient and chemical run off and prevent erosion.

Profitability Comparison for 2014						
March 21, 2014	Corn	Soybeans	MxG Full Production	Switchgrass Full Production	Corn Stalks	Cobs
Yield bu or tons/acre	190	56	8.0	5.4	2.25	0.54
Price/bu - ton, Farm Gate	\$ 4.55	\$ 11.51	\$ 85	\$ 85	\$ 85	\$ 85
Other Payments	\$ -	\$ -				
<b>Income</b>	<b>\$ 865</b>	<b>\$ 645</b>	<b>\$ 680</b>	<b>\$ 459</b>	<b>\$ 191</b>	<b>\$ 46</b>
Fertilizer	\$ 109	\$ 54	\$ 35	\$ 30	\$ 47	\$ 5
Chemical	\$ 63	\$ 71	\$ -	\$ -	\$ -	\$ -
Seed	\$ 145	\$ 50	\$ 50	\$ -	\$ -	\$ -
Power, Equip	\$ 96	\$ 79	\$ 92	\$ 156	\$ 62	\$ 15
Strg, Drying, Bldg	\$ 40	\$ 9	\$ 16	\$ 9	\$ 4	\$ 3
Labor paid and unpaid	\$ 56	\$ 56	\$ 30	\$ 25	\$ 16	\$ 16
Misc, Ins, Interest	\$ 62	\$ 48	\$ 27	\$ 25	\$ 8	\$ 4
Land Rent	\$ 300	\$ 300	\$ 250	\$ 250	\$ -	\$ -
<b>Expense</b>	<b>\$ 871</b>	<b>\$ 667</b>	<b>\$ 500</b>	<b>\$ 495</b>	<b>\$ 137</b>	<b>\$ 43</b>

## Message

This technology will encourage small, yet scalable markets for biomass; and without markets there will be very little biomass produced. It only takes a few acres of MxG to supply an average farm with its thermal energy needs. Any surplus biomass can be sold to others. As a consumers thermal energy needs grow, additional boilers can be very efficiently added.

Biomass is a new crop and a new fuel for us, but as we gain experience with it, more acres will be planted. Eventually we will gain enough confidence in our production and processing abilities that in some situations large biomass plants can be built; Plants that can produce liquid fuels, electricity and large scale thermal energy.



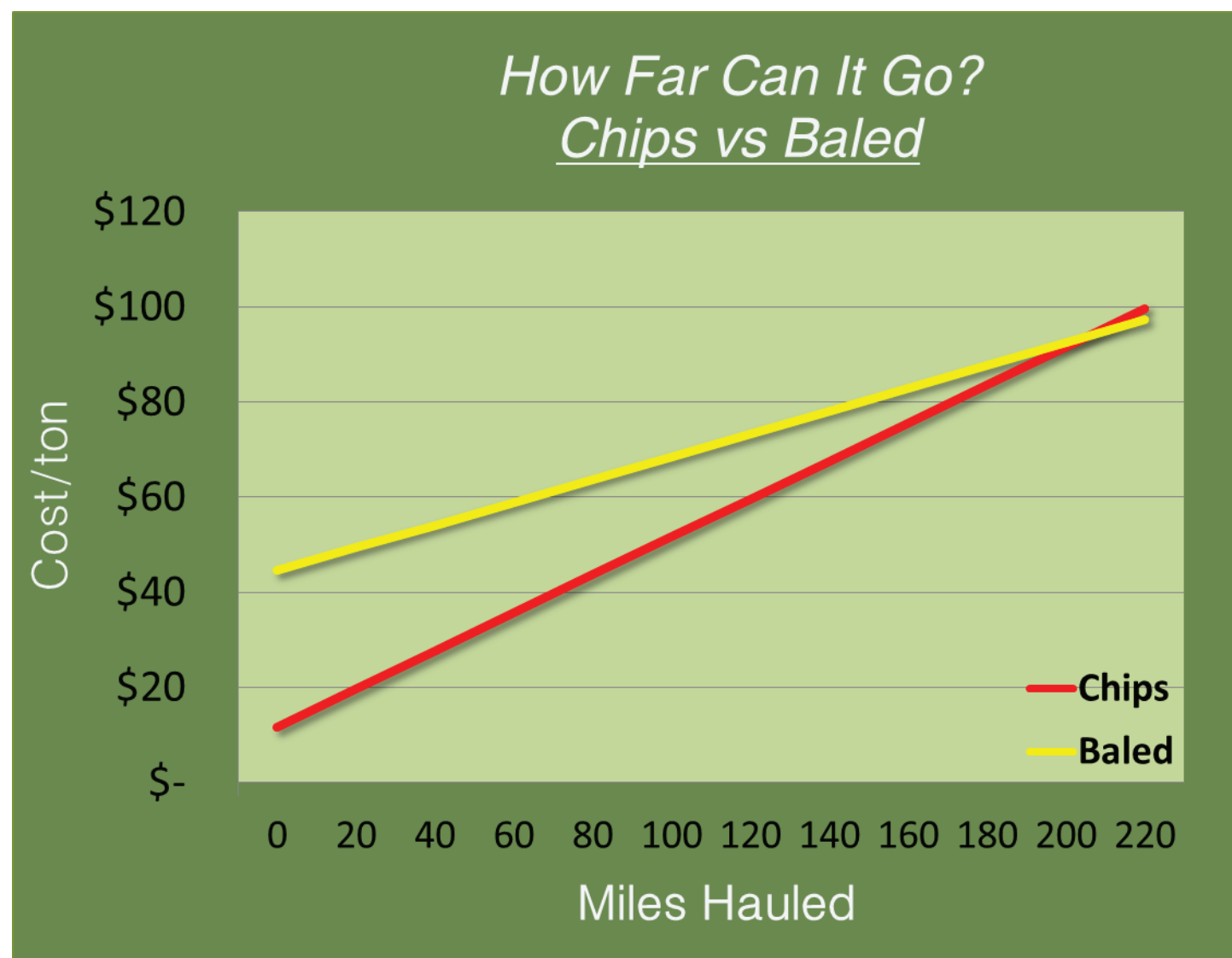
Fuel Selection Screen on RHK-50 Boiler Monitor

Heizomat boilers will automatically adjust temperature and air flow according to the user specified fuel source, allowing for the use of most economical fuel available.

## Reality of Transportation

Cost to move 1 ton of dry MxG from standing crop to boiler  
*BALE vs CHIPS*

Large Square Baler	Silage Chopper
Mow & Windrow \$2.00	Chop & Pile at End of Field \$10.00
Baled/Stacked in Field 3'x4'x8' 1200lbs \$26.00	Load Truck w/ End Loader - \$50/hr \$1.00
Load Truck w/ Forklift \$50/hr \$1.50	Haul 15 tons - 50miles \$6/loaded mile \$20.00
Haul 25 tons - 50miles \$6/loaded mile \$12.00	Unload Walking Floor Truck into Storage \$0.25
Unload Bales into Storage w/ Forklift \$1.50	Convey to Boiler \$0.25
Move Bales to Grinder \$1.00	
Destring & Grind \$12.00	
Move Chips to Storage \$0.25	
Convey to Boiler \$0.25	
<b>Total - \$56.60</b>	<b>Total - \$31.50</b>



Pelletizing would add \$20-\$30/ton to both methods



## Harvest & Storage

Economics and efficiency coincide at harvest. Silage choppers, with minimal adjustments, produce a miscanthus chip with less transportable density but with a size consistency ready to burn.



## Density

Harvested MxG	Chopped = 130kg/m³
	Baled = 170-200kg/m³
Harvested Corn	600kg/m³

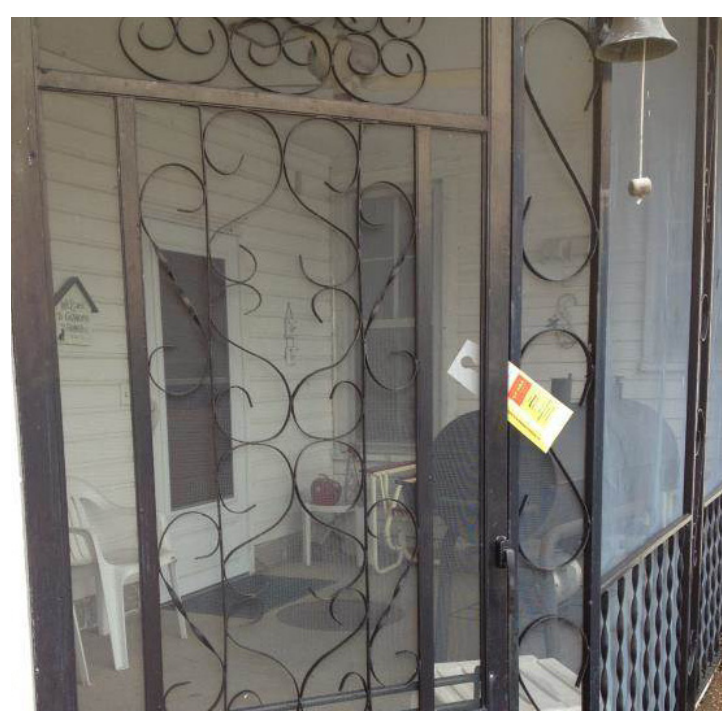


## Replacing LP Gas

Biomass heat can be used successfully for businesses and clusters of homes, although the energy cost savings is not as great when replacing today's cheap natural gas instead of the higher priced LP gas.

**ONE TON of DRY MxG**  
**\$85**  
**=**  
**170 GALS of LP GAS**  
**\$340**

Biomass systems are becoming so sophisticated and maintenance free that soon the only job of the owner will be to pay the bill for the biomass.

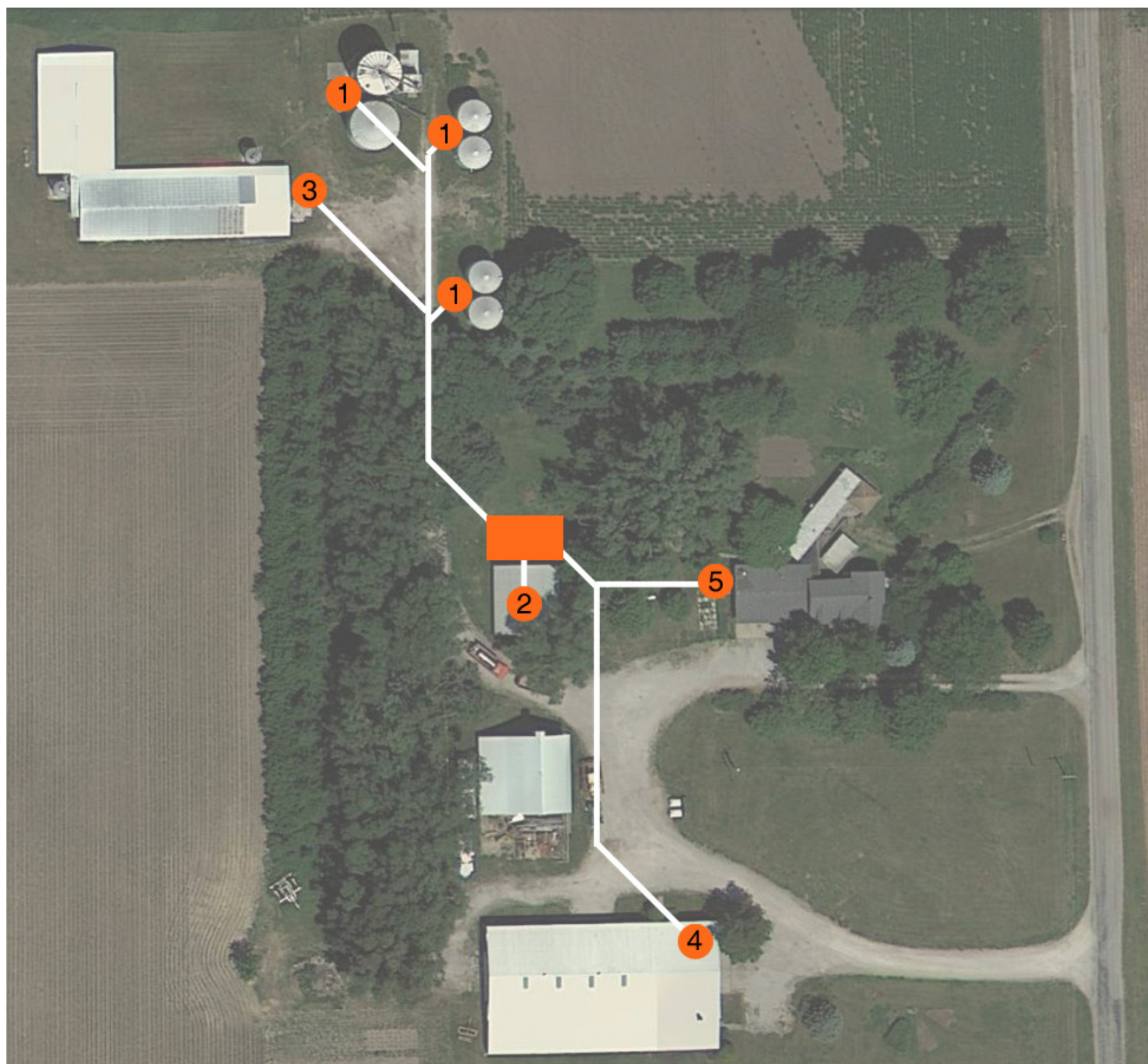


## Thermal Demands

The equipment available today that can efficiently utilize multiple biomass fuels becomes economically viable in situations requiring boilers in the 75 KW to 1 MW size. On livestock and grain farms a centrally located boiler could provide the thermal load for:

- 1 Grain Dryers
- 2 Green Houses
- 3 Livestock and Poultry Facilities
- 4 Farm Shops
- 5 Residence

Subsurface and insulated supply and return lines are used to distribute on demand heated water to the various grain bins and other structures.



Rural Farm and Single Family Residence

## GREEN FLAME ENERGY FIELD TO FLAME BIOMASS SERVICES

Green Flame Energy was founded in 2010 to initiate the idea that fuel can again come direct from the field. A fuel source grown and harvested locally can be used to heat homes, shops and even large facilities. Eric Rund, a third generation farmer in East-central Illinois, has transitioned 7% of his land to Miscanthus. He has planted over 200 acres in three Midwestern states for other people and has consulted with and given presentations to many hundreds more over the last five years. In 2009 Eric traveled to Europe where Miscanthus gignatus had become the biomass energy crop of choice for German and Austrian farmers. He learned from them most of what he knows now about growing, harvesting, and utilizing the crop.

