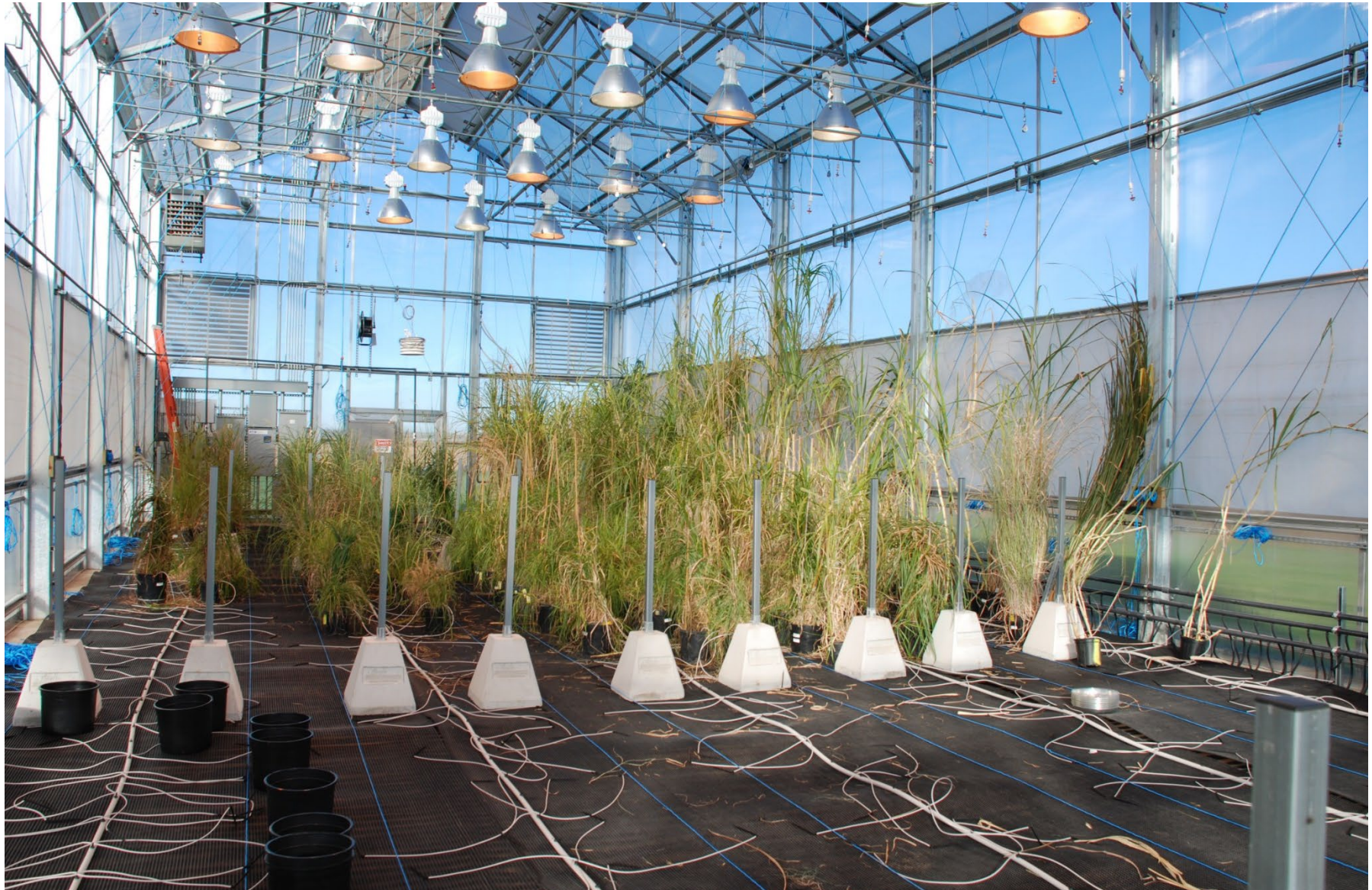
Field to Flame Biomass Heating Objectives

- Upgrade a research greenhouse to a hot water heating system fueled by low carbon perennial grasses grown on site, completing the field to flame concept.
- Provide a demonstration facility to augment outreach to the community on opportunities for biofuel heating on a small/medium scale.
- Engage research groups on campus to build upon the lessons learned to facilitate expansion to megawatt class heating systems for the larger campus.

Primary Objective 2100 ft^2 x 20’ Greenhouse



Heizomat Chain Drag Boiler

- Multi Fuel Capable Boiler
  - Miscanthus
  - Wood Chips
- 2000 gallon thermal storage to improve boiler efficiency
- Variable output to match load / maximize efficiency

Feedstock storage / collection system

Bunker design with a turntable agitator to minimize chances of material “bridging” and other flow issues with non-uniform sized feedstock particles.

Demonstration district heating system

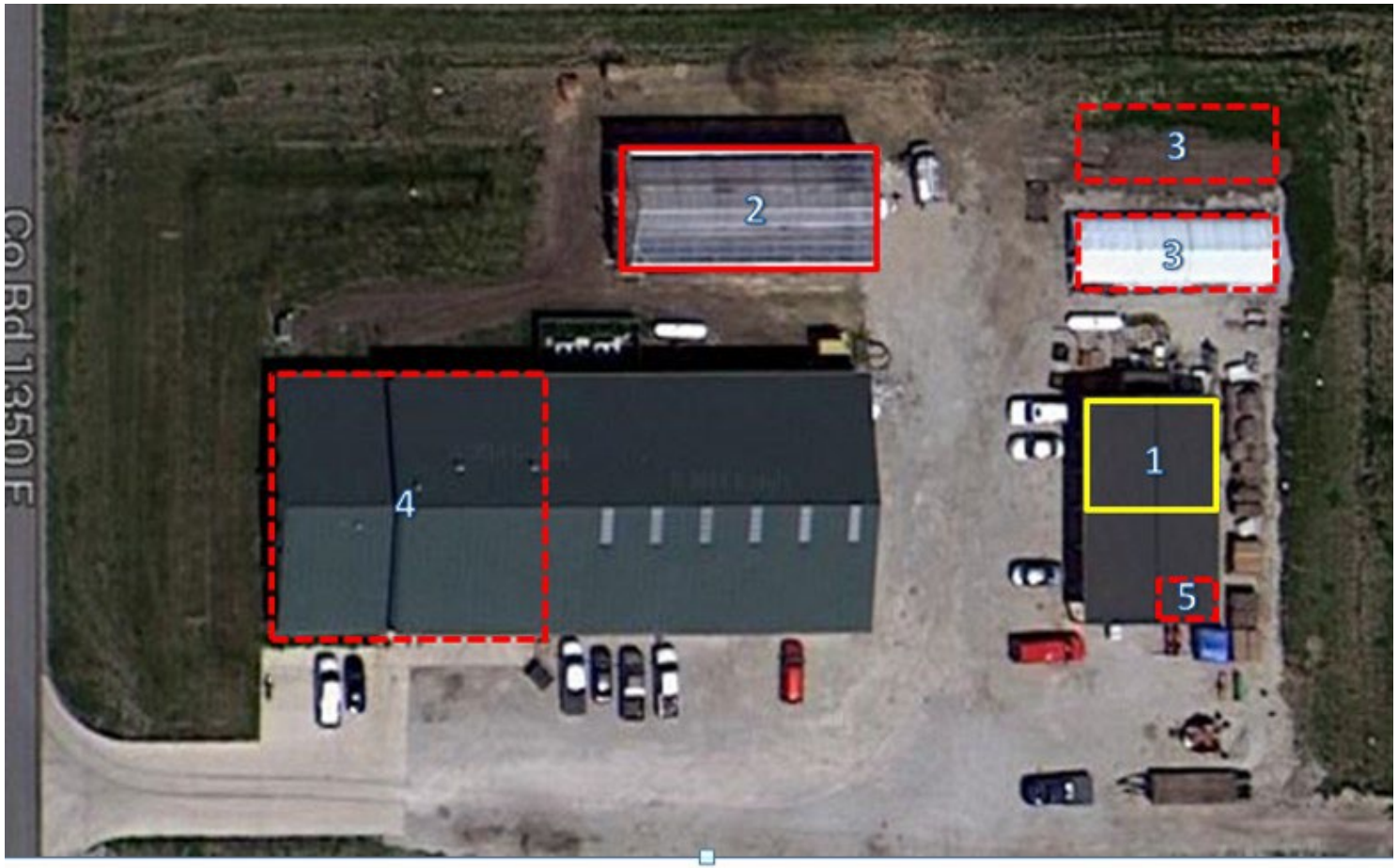
1 : Central Boiler Plant

2 : Crossing Greenhouse

3 : Hoop house plant space

4 : Main office building / offices

5 : Research sample drying oven



Funding Sources

- Illinois Clean Energy Community Foundation $228,260
- University of Illinois Student Sustainability Committee $100,000
- Dudley Smith Initiative – UI Extension $17,848
- University of Illinois Internal Funds (Chevy) $200,892

Timeline

- Will be working on this with Josh Rubin in the next week.

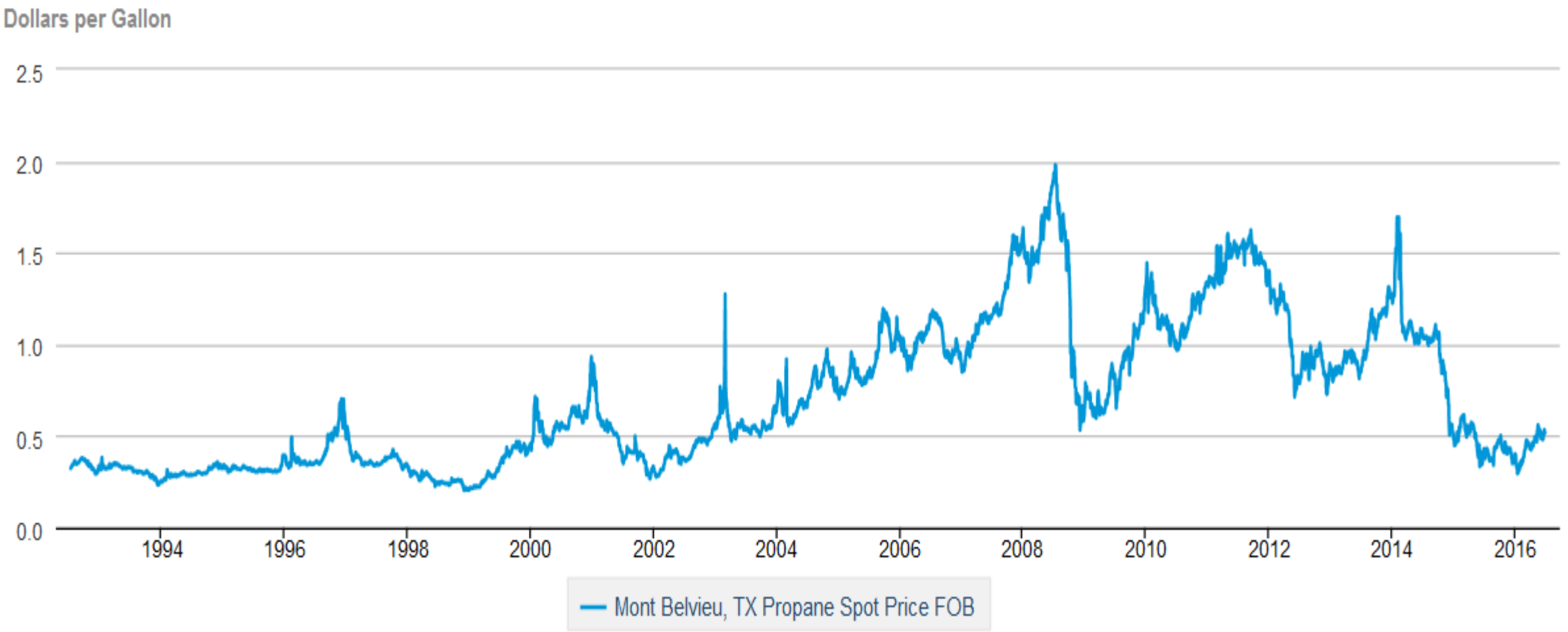
Biomass Cost Benefit

Glasshouse	Hoop Houses	Main Offices	Total Savings	
10,031	**6,214**	**2,960**	**19,205**	Gallons propane 2014
916	**568**	**270**	**1,754**	Total MMBTU
65.4	**40.5**	**19.3**	**125.3**	Tons MXG to replace
$3,272	**$2,027**	**$965**	**$6,264**	Cost @ $50/ton
$22,037	**$13,291**	**$6,095**	**$41,422**	Cost of Propane
$18,765	**$11,264**	**$5,129**	**$35,158**	Cost Savings
63.45	**39.30**	**18.72**	**121.47**	Tons CO2 release by Propane

Constraints :		
	Propane Btu/gallon	91,333
	Average propane price	$2.22
	Miscanthus Btu/lb	7,000

Mont Belvieu, TX Propane Spot Price FOB

DOWNLOAD



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Lessons Learned (thus far)

- Engage with manufacturers and current users to keep from re-engineering the wheel.
- Lack of US manufacturers building in this size class with a demonstrated ability to burn perennial grasses led to boiler imports
- Cost effective installations need to rely on upgrading existing hot water heating systems, not installing new heat systems from scratch.
- More to come next year!