

# Hydronic (U.V. Solar) Heating Installation

Joe Wilson, CEO  
Bio-Response Solutions, Inc.



# June 21, 2013, Groundbreaking





# The building was to be:

- 14,250 square feet of manufacturing and office space in a steel building made in Indiana (Nucor)
- The first building in Indiana to be designed from the ground up for UV Solar Heat using technology proven at other Indiana institutions for heating water
- Heat delivery via hydronic (circulated water) tubes in the floor of the building, zoned for individual control in the occupied first floor offices
- Insulated to R-30 (walls and ceilings)
- With a concrete parking lot (not asphalt) for reduced heat load on the property in the summer

# Our Message



# The time is NOW for Energy Responsibility



The background image shows a vast, flat, dry landscape with a cracked, orange-brown surface. In the distance, there are low, hazy mountains under a heavy, grey, overcast sky. The overall tone is somber and emphasizes the theme of drought or environmental neglect.

# **And this....**

# **LEED**

**Are we taking this  
seriously?**

**If we don't then  
who will?**

# Energy alternatives prevent pollution!

## Solar Options



## Wind





Jack McMahan, Right, with the Sunquest 250 Solar Panel. Solar America Solutions is an Indiana Company who are on the leading edge of Solar UV technology and performance





# U.V. Collection produces hot water:

The collection tubes consist of vacuum tubes over an energy absorbing surface that transmits heat into liquid filled copper tubes. The heat rises in these copper tubes to the collector at the top of the array. There are 25 tubes per array in 7' x 7' panels that weigh about 200 pounds each. These panels are sequentially plumbed in groups of 5 panels. Net system cost is less than \$5,000 per panel.





Ross Correctional Facility, Chillicothe, Ohio are installing 400 panels to heat all of their facilities and their shower water





Wabash  
Correctional  
Facility in  
Indiana; 10  
panels for  
hot water!





# Our Building in Danville





We have 10 panels, 5 on each side of the roof





# Panels on the West side of the roof



# How Much Energy Can We Get?

From 15,000 to 30,000 BTU per hour per panel (cloudy v.s. sunny days)!

## PERFORMANCE UPDATE

**Location:** Midwest Renewable Energy Association Training Center, Custer, WI

**Date / Time:** Wednesday, January 29, 2014 – 9:19AM, CST

**Weather:** Sunny

**Temperature:** -6° F

**Number of Collectors:** 5

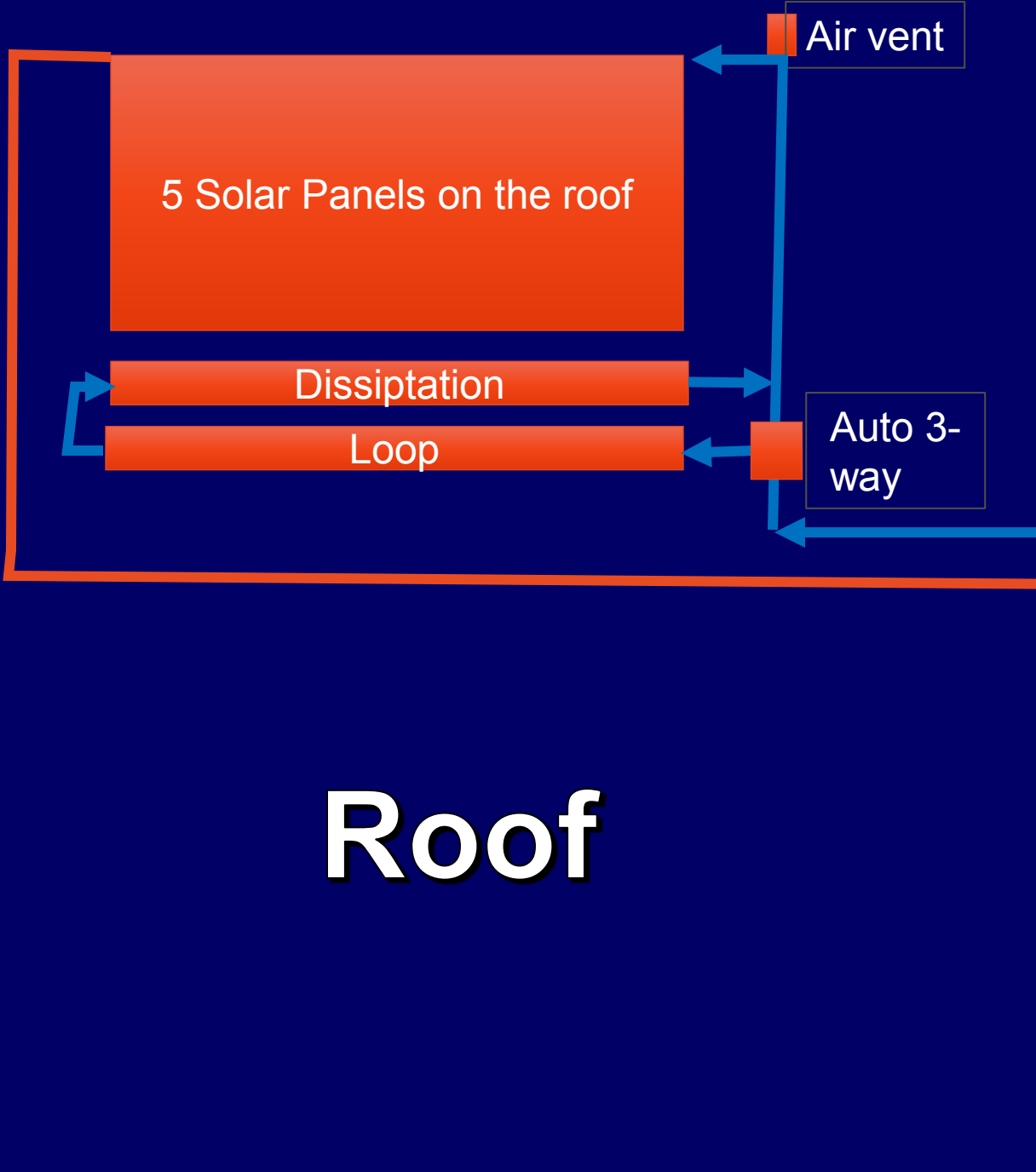
WATER TEMP OUT	–	WATER TEMP IN	=	TEMP RISE	FLOW RATE
121° F		75°		46°	7.2 GPM

### BTU Computation

- 1 gallon of water weighs 8.35 lbs.
- 1 BTU is required to raise 1 lb. of water 1° F.
- 8.35 BTUs to raise 1 gallon of water 1° F.
- Flow rate x 8.35 x temp rise = BTU per minute x 60 = BTUs per hour ÷ 5 collectors = BTUs per hour, per collector.

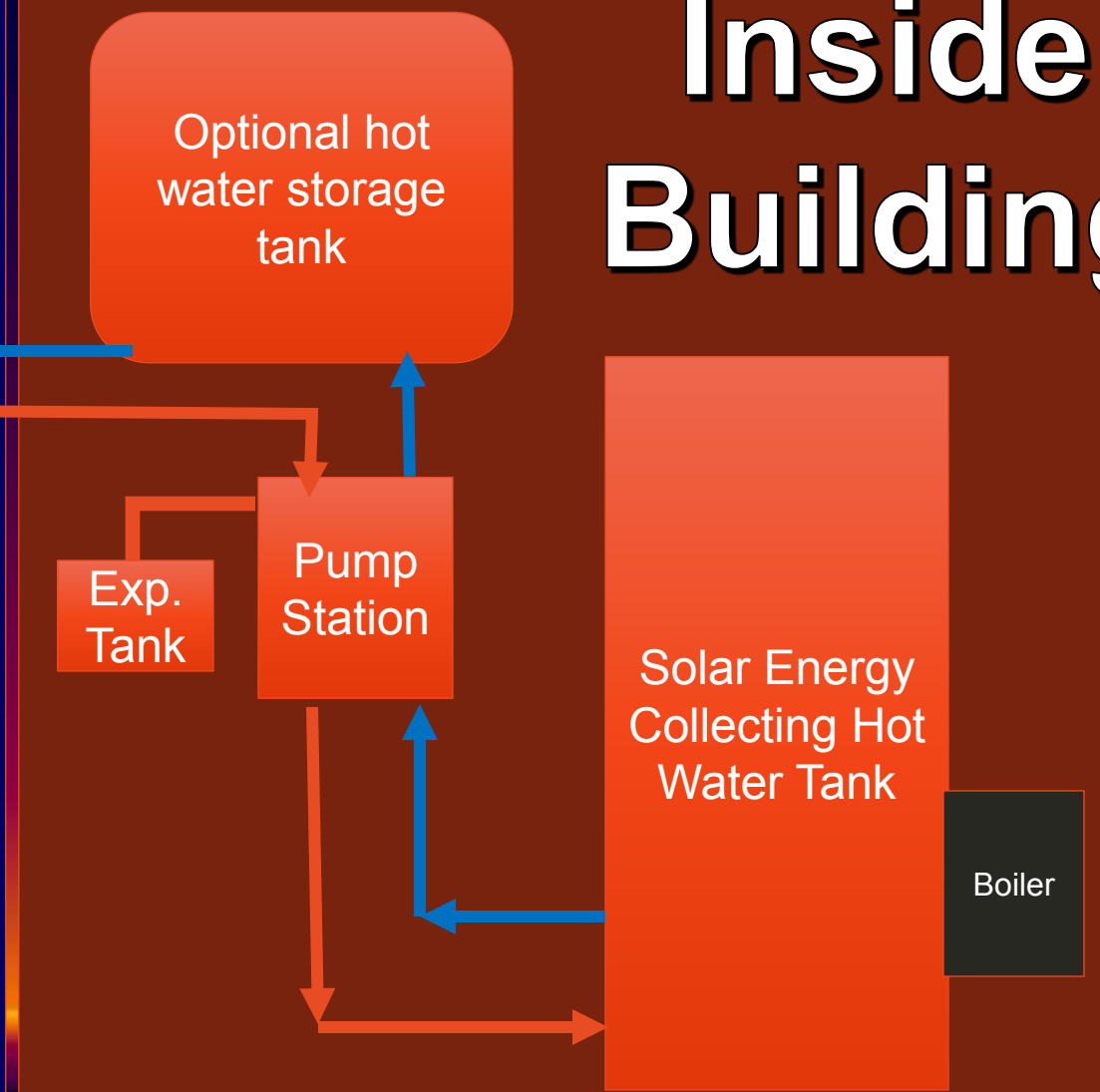
7.2 GPM (flow rate) x 8.35 BTUs x 46° (temp rise) = 2,765.52 BTUs per minute  
2,765.52 BTUs per minute x 60 = 165,931.2 BTUs per hour  
165,931.2 BTUs per hour ÷ 5 collectors = **33,186.24 BTUs per panel per hour\***





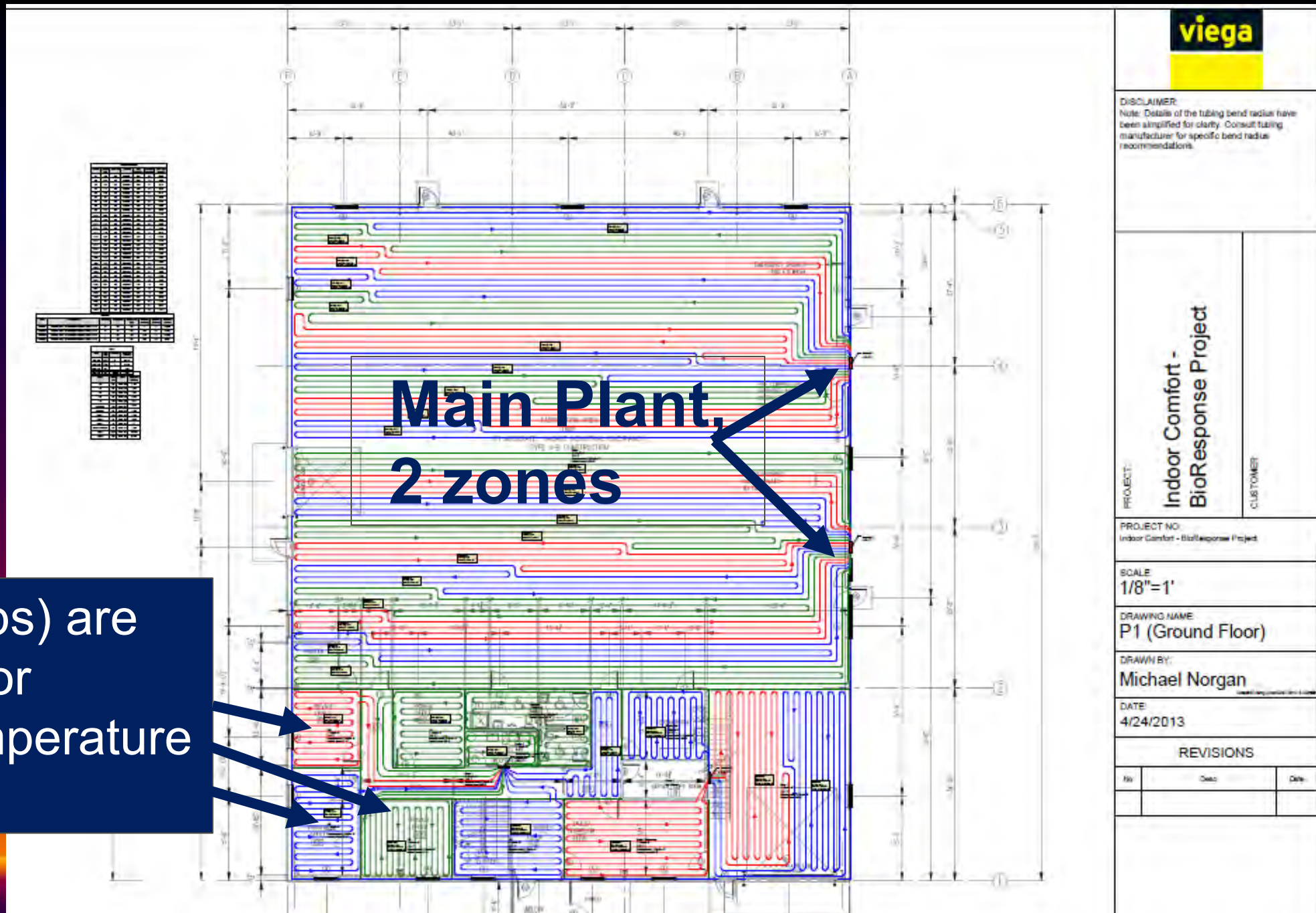
The system is simple:

# Inside Building



# Hydronic Heat Transfer Tubing layout (PEX Tubing)

Offices (or labs) are  
each zoned for  
individual temperature  
control





# Pex tubing and Creatherm underlayment in place





**1 million  
pounds  
of  
concrete,  
A huge  
heat sink  
to keep  
things  
warm  
at  
night!**







Solar pump

The mixing valves will mix the correct ratio of hot and return water to send through the floor to maintain the proper temperature

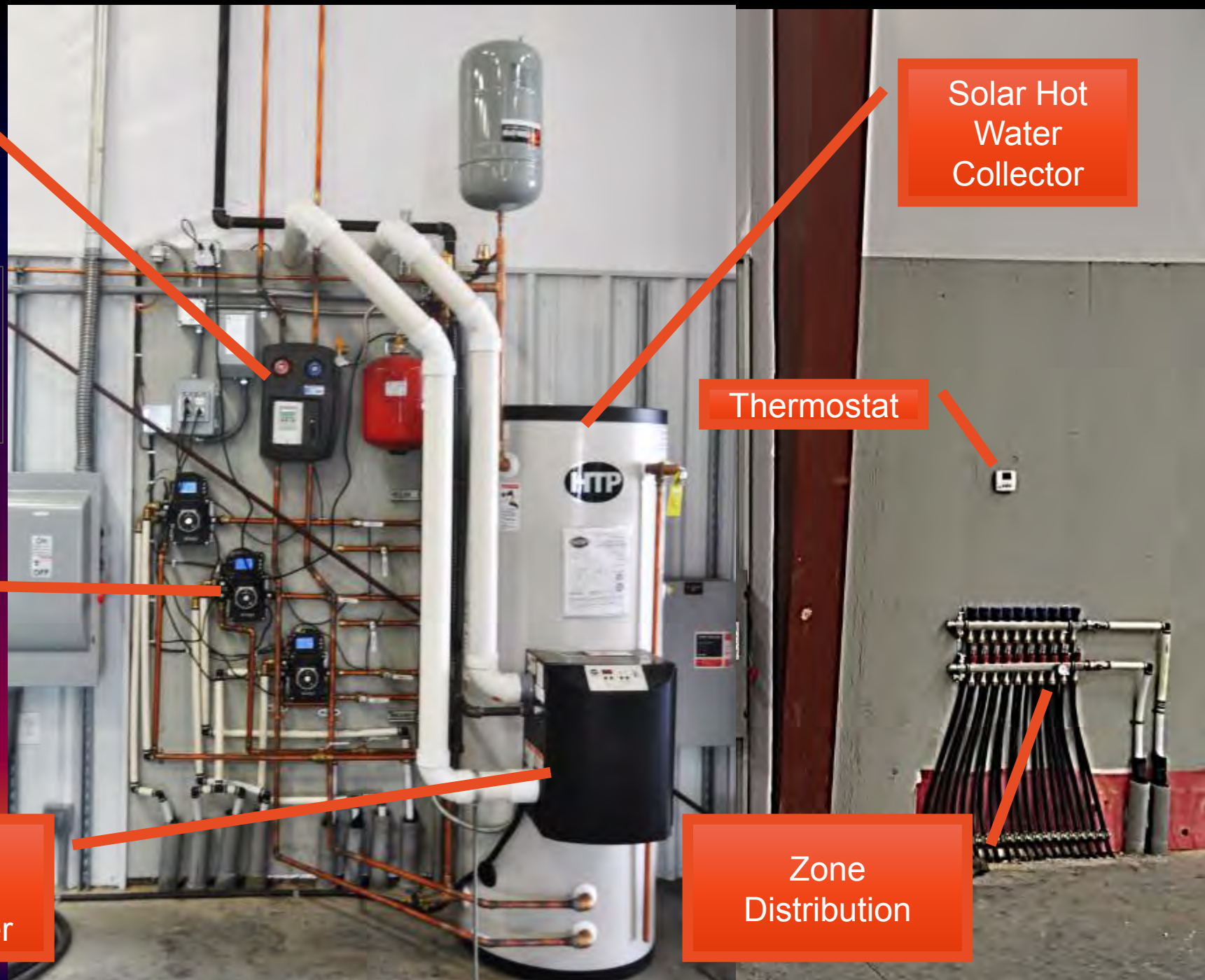
Mixing Valves  
and Pumps

Staged  
Condensing  
back-up boiler

Solar Hot  
Water  
Collector

Thermostat

Zone  
Distribution

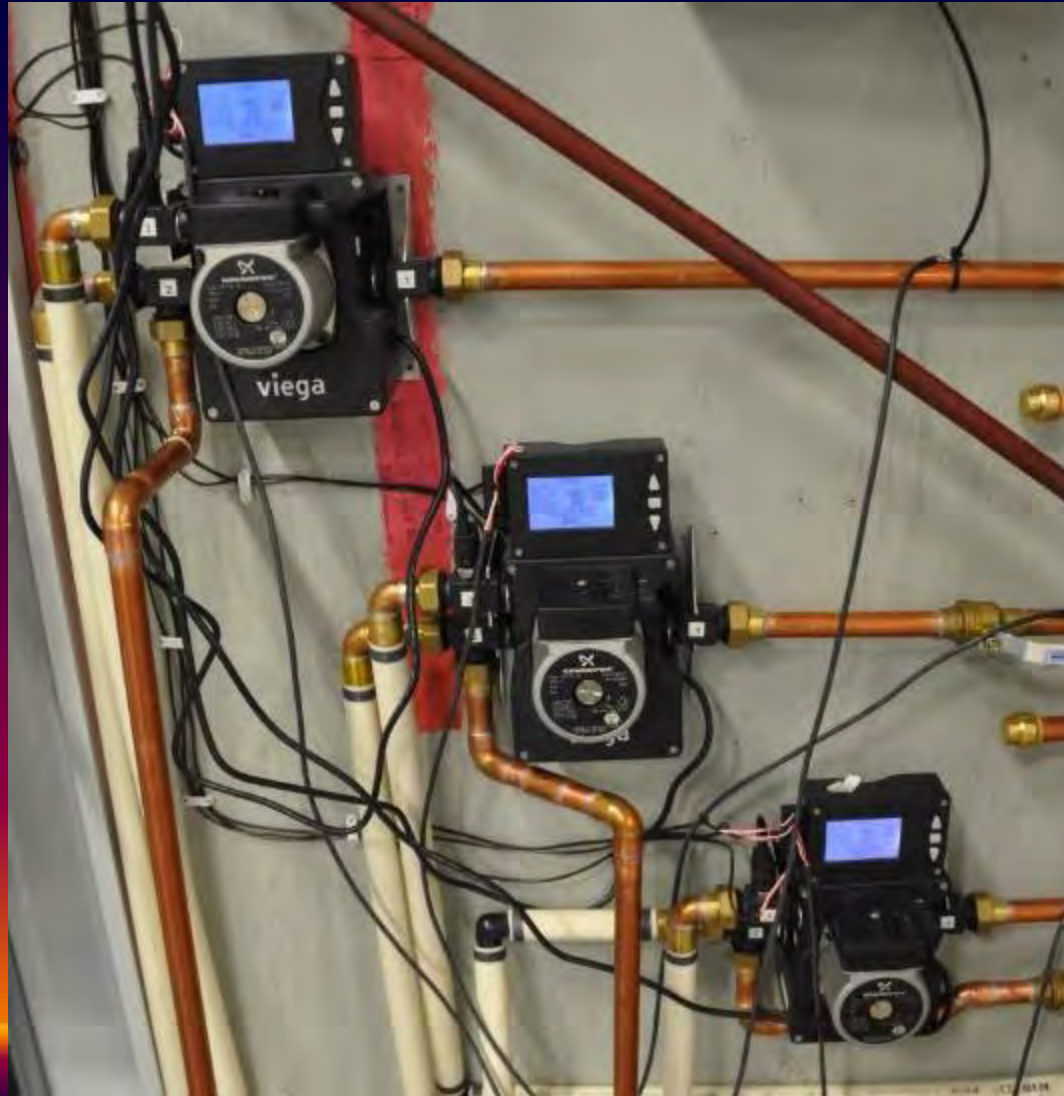




We keep the  
condensing boiler  
at 95 degrees F  
during the winter  
to keep the  
building up to 65  
degrees at night



# Mixing valves do the work



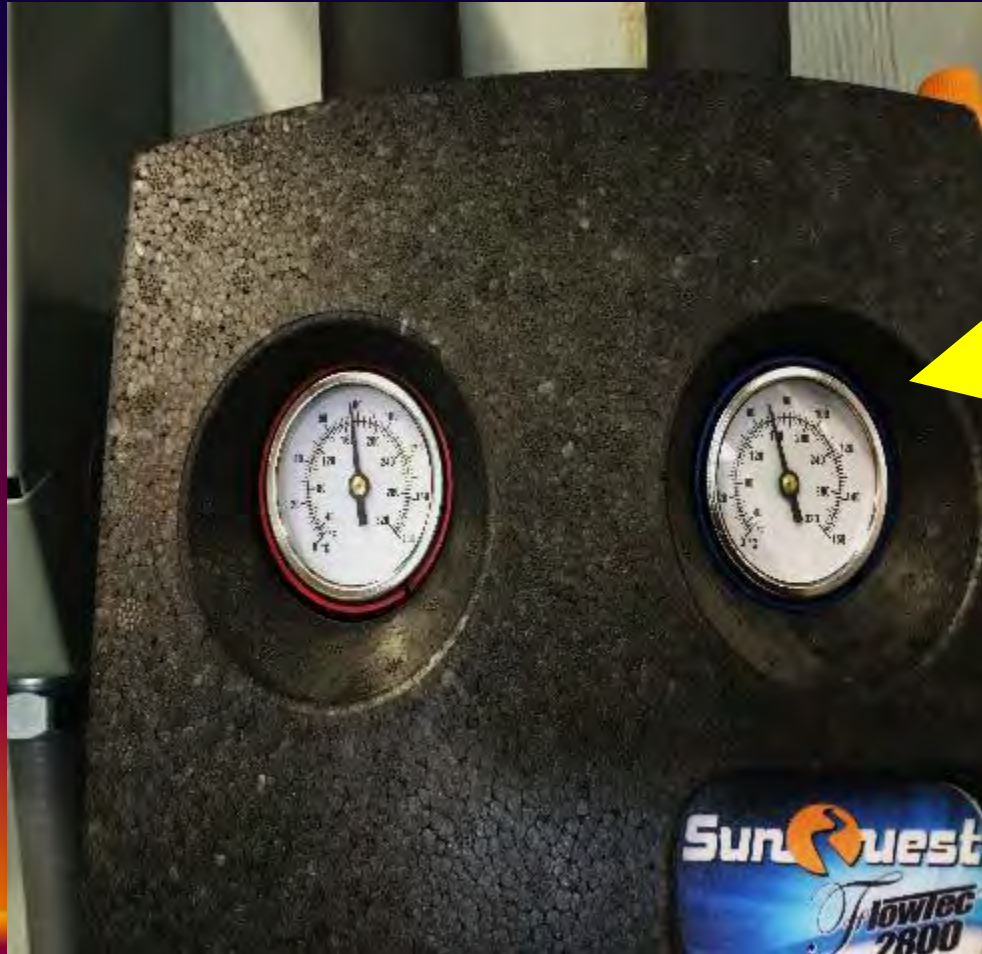


# Zone Control





Hazy Day, 170 degrees  
coming from the panels!







# Financials:

- \$120,000 cost all in
  - Materials \$75,000
  - Equipment install in building \$25,000
  - Final plumbing and roof install on building \$20,000
- 30% government tax credit on heat delivery system, we believe we can include insulation and concrete (\$180,000 total) as part of the heat delivery system, so possible \$36,000 to \$54,000 tax credit, **to be conservative we will assume \$40,000**
- \$40,000 equipment deduct (other heating apparatus not needed)
- \$40,000 tax credit deduct
- **Net cost, \$40,000**



# Amortization:

- \$40,000 net expenditure to recover
- Hydronic radiant (floor) heating is 40% more efficient than heating the air, so assuming this multiplier:
  - \$5,000 per year gas bill with conventional heating
  - -\$1,500 per year efficiency gain due to hydronic radiant heating = \$15,000 saved in 10 years if gas remains priced the same.
  - \$2,500 per year replaced by solar heat = \$25,000 in 10 years assuming gas remains priced the same
- Easily a 10 year payback, probably better than that but lets be conservative!

# Why we did it?

1. To be energy responsible; to exemplify how we need to think if we are to prolong our energy resources on the planet
2. To show our prospective clients that we “walk the walk” when talking about energy efficiency advantages offered by our product designs (some of our systems operate at only 5% of the net energy requirement of commonly specified competitive technologies)
3. Comfort of our employees; hydronic radiant floor heating has no comparable comfort equal
4. To save money over the long run; betting natural gas cost will rise substantially over the next 10 years!



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**Thank You for  
your attention!**