



# Large Campus Geothermal: Repurposing Energy

PRESENTED BY

**Jeff Urlaub, PE**

President

[jeffu@mepassociates.com](mailto:jeffu@mepassociates.com)



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# Agenda



- **Epic Corporate System**

- Campus Overview
- Geothermal System
- Energy Source
- Geothermal Statistics
- Benefits of Geothermal



BALL STATE  
UNIVERSITY.

- **Ball State University**

- Campus Overview
- District Energy Stations



MIAMI  
UNIVERSITY  
OXFORD OHIO



- **Other Large Campus Conversions**

- **Questions?**

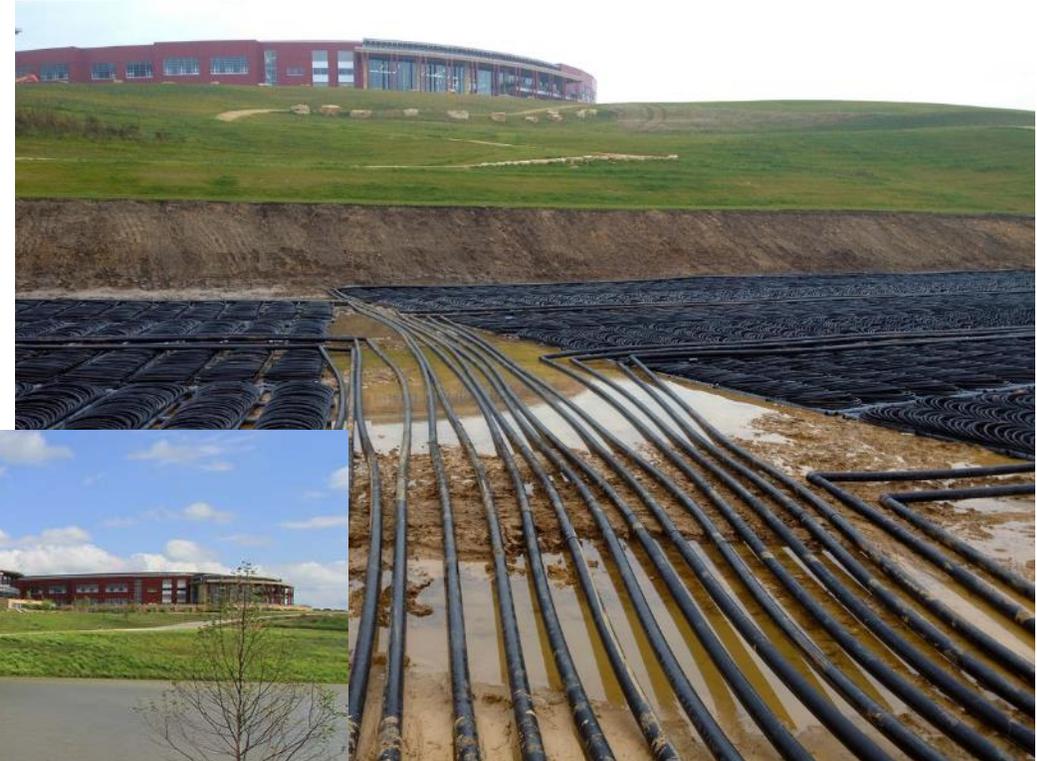
# Epic System Overview - Verona, WI



## Conversion Facts

- Approximately 1051 Acres
- Over 7.0 Million SF occupied space
- 27 Existing Buildings
- 12 Buildings under construction
- 7,338 Underground parking stalls (4 multi-level garages)
- 1.5 MW Solar PV
- 10 MW Wind Generation

**Epic**



# Geothermal System

- **Bore Fields (vertical bore shafts)**
  - Bore Field 1: 576 bores @ 300 feet
  - Bore Field 2: 1,000 bores @ 300 feet
  - Bore Field 3: 2,000 bores @ 420-480 feet
  - Bore Field 4: 2,596 Bores @ 500 feet
- **Storm Water / Geo Pond**
  - 1,296 slinky loops @ 600 feet each
  - Pond Depth: 10-15 feet

**Energy Usage Loops**

**Energy Exchange Loop**



# Energy Source

- Utilized when the campus energy loop is out of balance
- Stand-alone Pump House
  - 6 Pumps designed to pump 60,000 gpm through 6,127 vertical bores and 1296 pond loops (*designed for 8 Pumps*)
  - 6 Pumps designed to pump 60,000 gpm of loop water around the campus to serve stand-alone heat pump chiller plants



# Production of Energy

## 4 Central Energy Plants (CEP)

- Farm Campus
- Campus 2
- New CEP
- Epicenter / Pluto



# Geothermal Statistics

- 502 miles of vertical piping in geothermal wells
- 16 miles of horizontal underground piping (6"-36" diameter)
- 300 miles of piping resting at bottom of Geo Pond
- 100 miles total pipe length
- 4 million gallons of water to fill system (No glycol)
- 6,172 Vertical Bores 300 ft. to 500 ft. in depth
- 15,000 tons cooling capacity
- Maximum design flow is 80,000 gallons per minute



# Benefits - Geothermal System

- **Reduced Maintenance**

- 0.3 FTE
- Closed loop System – Water Only (no glycol)
- No Boilers or Cooling Towers to Maintain
- Oil-Free Centrifugal Chillers

- **Energy Footprint Reduction**

- **Carbon Reduction**



# Ball State University Overview – Muncie, IN

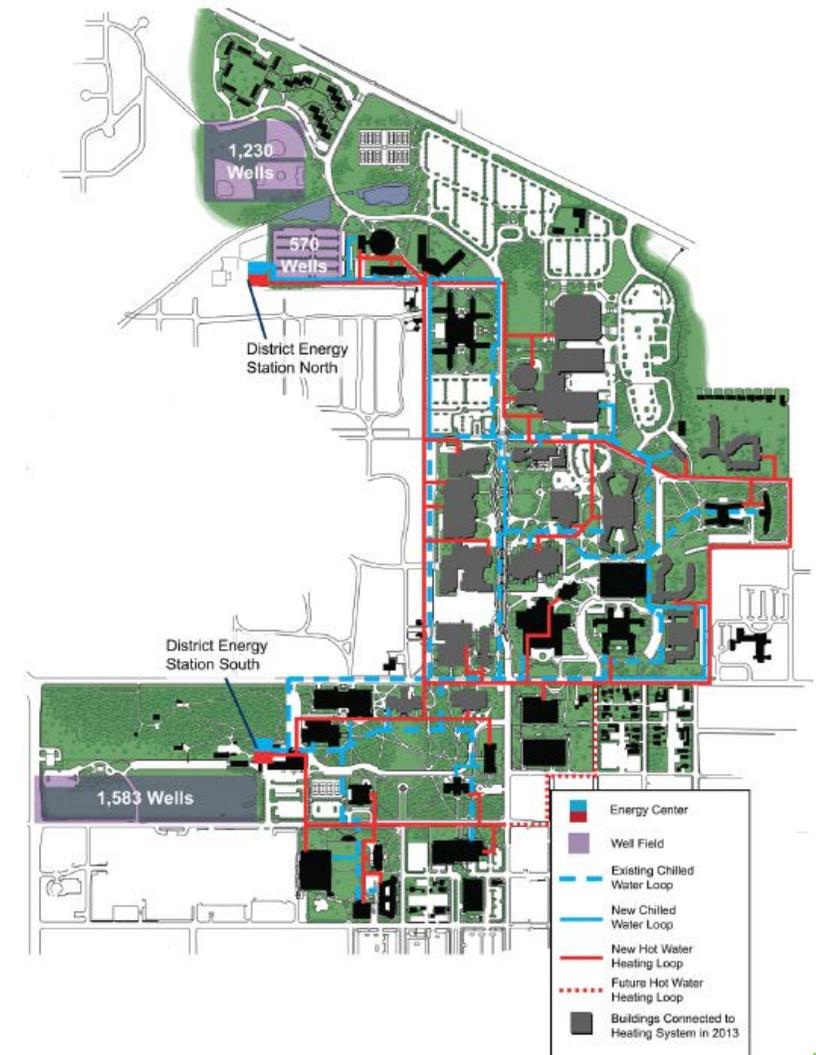
## Centralized 4-Pipe Distribution

### Conversion Facts

- 10,000 Tons Cooling
- 152,000,000 BTU/HR Heating
- 5,600,000 GSF Heating Conversion
- 47 Building Heating Conversion
- Includes 300,000 GSF of Expansion
- 2 District Energy Stations
- 150°F HWS
- 20°F HW Delta T
- 80,000 Tons per/year Carbon Reduction

### Campus Energy Use Intensity

- Prior to Geothermal Conversion – 175 kBtu/SF/Yr
- Fiscal Year 2013 / 2014 – 123 kBtu/SF/Yr
- Anticipated at Project Completion – 105 kBtu/SF/Yr



# Ball State University – District Energy Stations

## District Energy Station – North

- 12,000 SF
- (2) 2,500 Ton Compound Centrifugal Compressor Heat Pump Chillers and accessory components
- 1,000 Ton Fluid Cooler
- USGBC LEED® Certified™ Gold



## District Energy Station – South

- 16,480 SF
- (2) 2,500 Ton Compound Centrifugal Compressor Heat Pump Chillers and accessory components
- (2) Centrifugal Chillers
- (4) 1,000 Ton Cooling Towers
- Reuse (2) existing Water-Cooled Chillers
- Registered with the certification goal of LEED® Certified Silver



# Ball State University – District Energy Stations

## North Distribution Utilities

- Completed August 11, 2011
- 10 miles of Hot Water and Chilled Water Pipe Installed

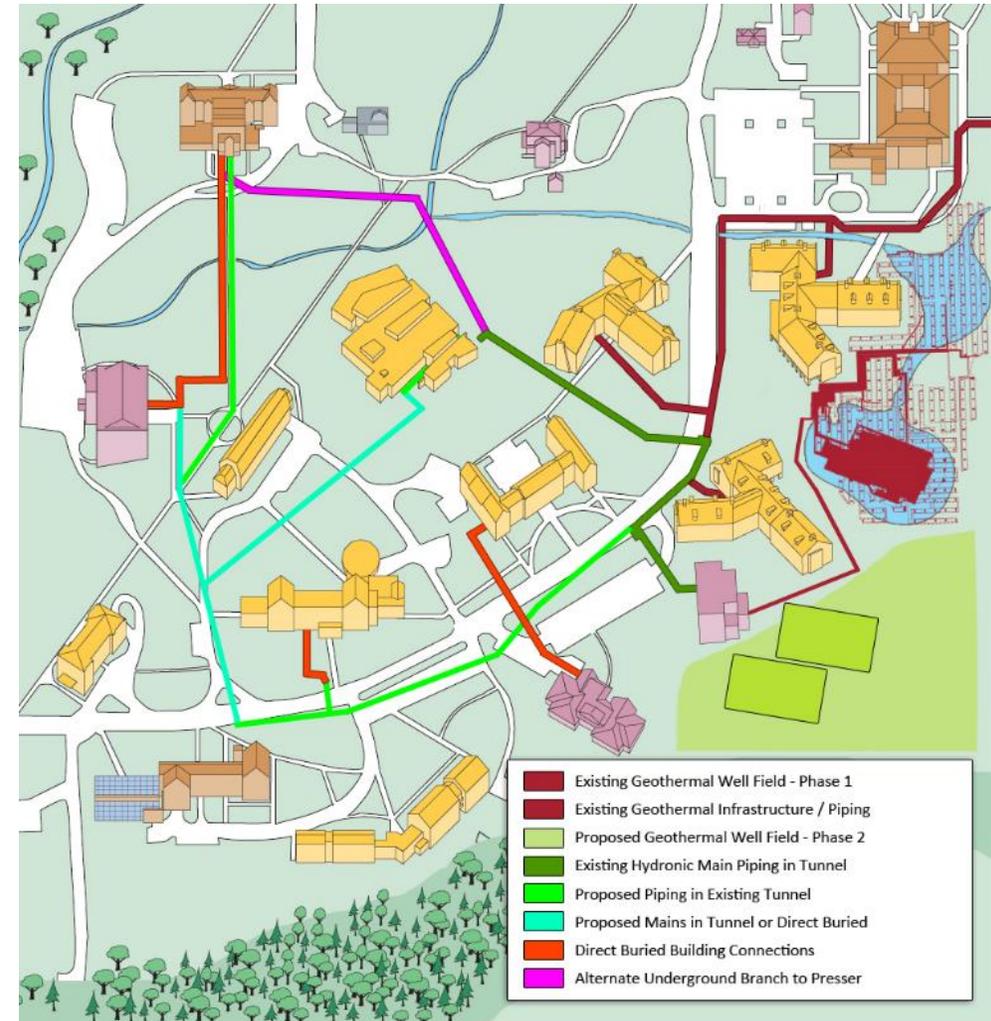


# Miami University Western Campus – Oxford, OH

## Centralized 4-Pipe Distribution

### Conversion Facts

- 2,800 Tons Cooling
- 49,355,000 BTU/HR Heating
- 15+ Buildings
- Vertical Bore Field – 710 Bores
- Matt Pond Loop – 133 Loops



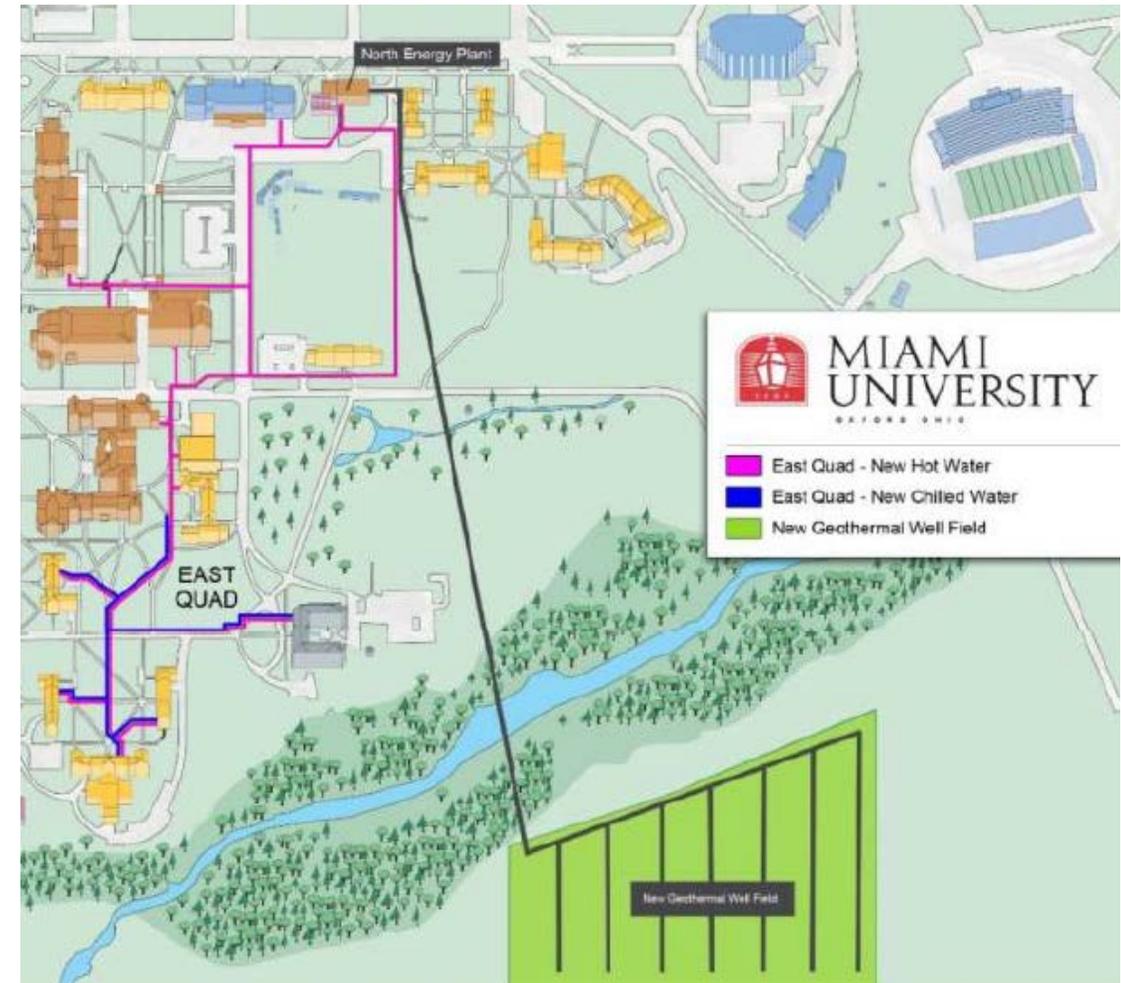
# Miami University – Oxford, OH



## East Quad

### Conversion Facts

- (2) 350 Ton Heat Pump Chillers
- 12 Buildings Connected
- 536 Ton Cooling
- B6,121 MH Heating



# Energy Education Center – CVTC, Eau Claire, WI

## New 54,000 SF Facility

- Design Solutions
  - Thermal Decoupling
  - Geothermal Heating & Cooling
  - Active Chilled Beams
  - Light Pollution Reduction
  - Water Use Reduction
  - Optimize Energy Performance
  - On-Site Renewable Energy
  - Outdoor Air Delivery Monitoring
  - Increased Ventilation
  - Indoor Chemical and Pollutant Source Control
  - Controllability of Systems
  - Lighting and 7.1
  - Thermal Comfort
  - In-floor Heating and Cooling

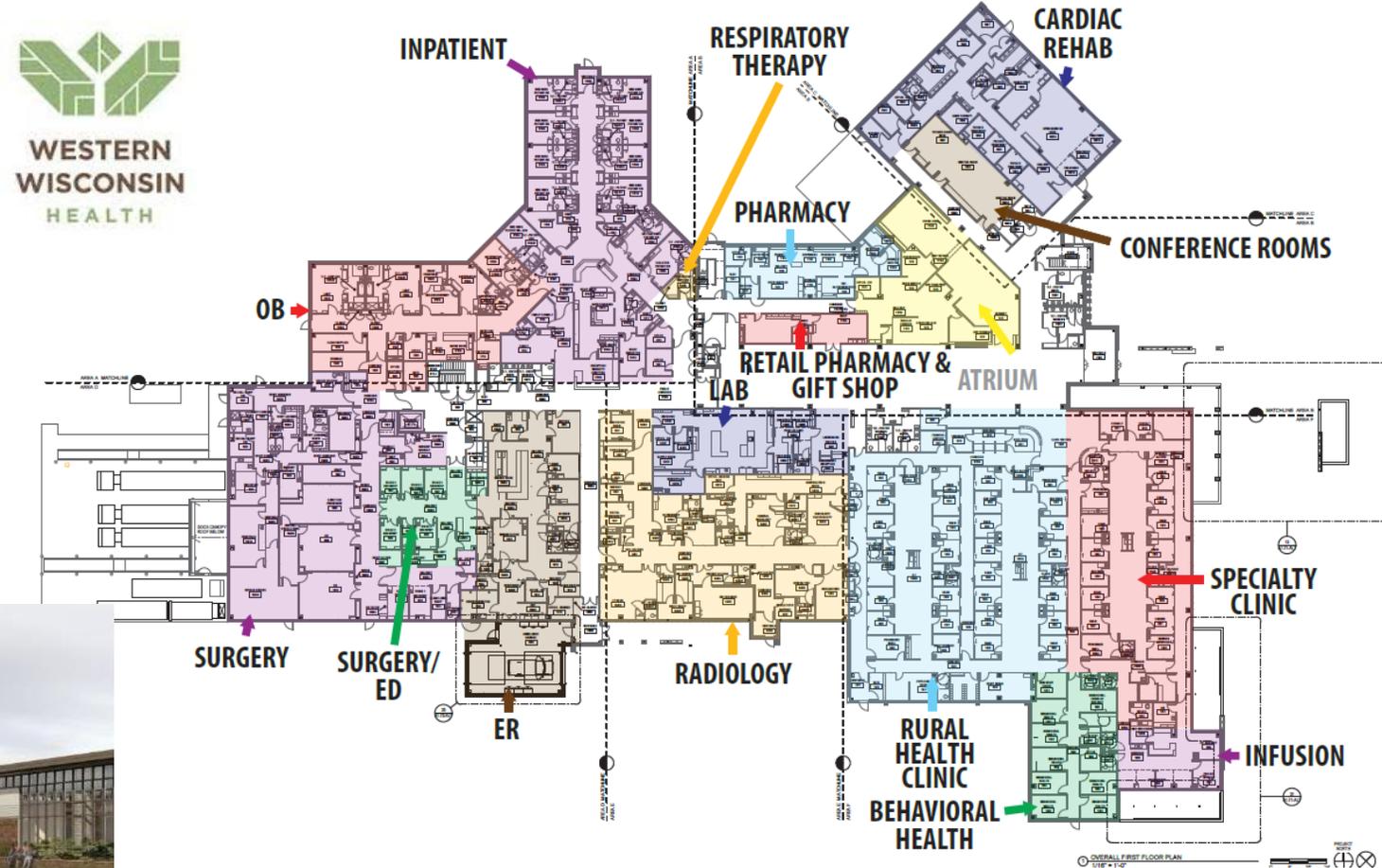


USGBC LEED®  
Certified™ Gold

# Baldwin Health & Wellness Campus – Baldwin, WI

## New CAH Facility

- Design Solutions
  - Thermal Decoupling
  - Geothermal Heating & Cooling
  - Chilled Beams
  - LED Lighting
  - Daylighting (90-95%)
  - In-Floor Heating
  - Snow Melting
  - Desiccant Wheel (AHU)





**Questions?**

*Thank You*



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