CampusEnergy2021

BRIDGE TO THE FUTURE

Feb. 16-18 | CONNECTING VIRTUALLY

WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16

Oberlin College Sustainable Infrastructure Program

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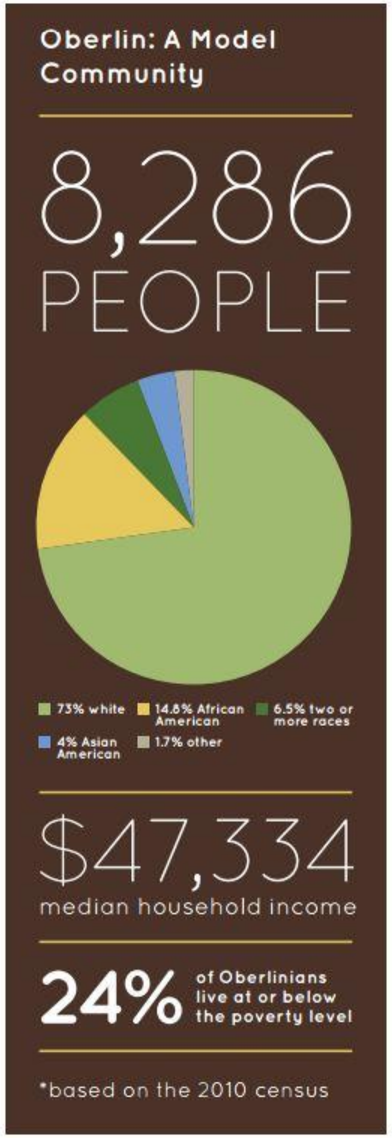
Q&A Will Not Be Answered Live

Please submit questions in the Q&A box.
The presenters will respond to questions off-line.

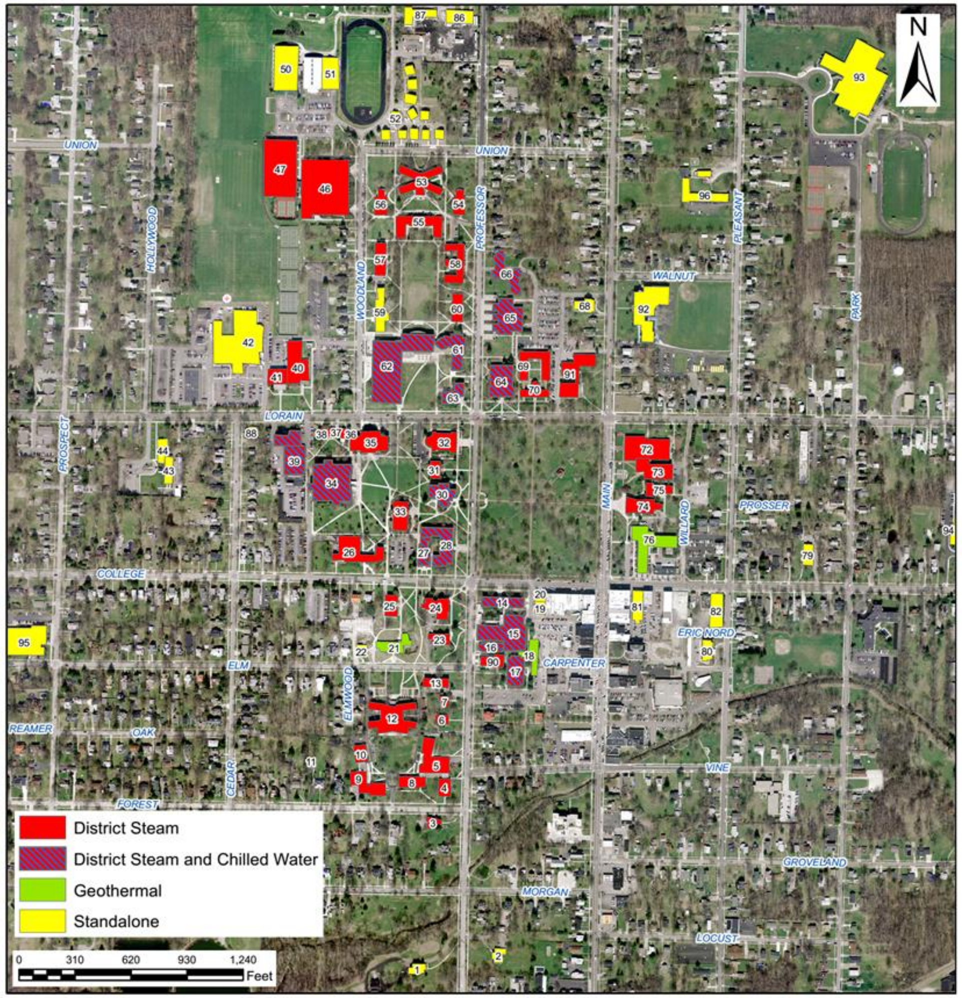
Campus & City Background

- Northeast Ohio, 30 miles west of Cleveland.
- City and college were founded at the same time in 1833.
- Residential liberal arts campus w/ 2,900 students.
- 2,500,000 SF, 85+ buildings.
- Oberlin Municipal Light & Power Service.
- Distributed heating and cooling systems.



Campus Energy Profile

- 56 buildings on central steam
- 15 buildings on central cooling
- Peak plant steam load ~65 MMBtu/hour
- Peak campus load ~80 MMBtu/hour
- 2.27 MW PV Solar Array
- ~200kW of PV Roof and Parking lot Canopy Solar Arrays
- 4 geothermal building systems
- Aged system, some parts over 100 years old.



Let’s go over that last point again…

really, really aged, old, ugly, & dying!

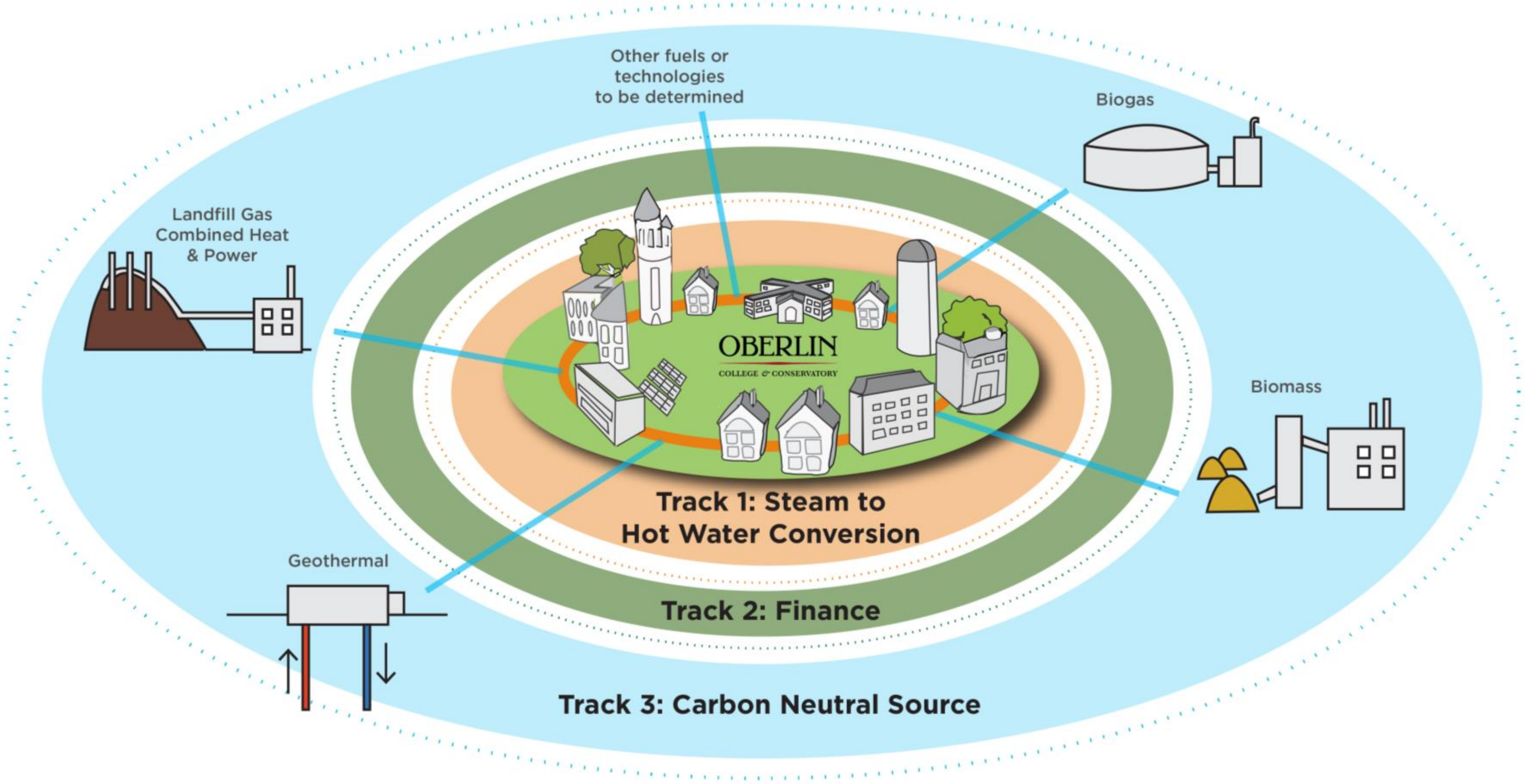
Oberlin College’s Call For Action

- Antiquated Steam System
  - Poorly maintained and inefficient district steam system
  - Increasing emergency shutdown trend
- Expanding Cooling Needs
  - Changing school calendar
  - Summer Programming
- Carbon Neutrality by 2025
  - Steam system is the biggest contributor to carbon emissions
- Broader Campus Utility Needs
  - Fiber, Electrical Infrastructure, Fire Protection
- Implementable and Financeable
  - Business and organizational structure solution

Oberlin's Sustainable Infrastructure Program Goals & Priorities

- Operational Cost Savings
- Carbon Reduction
- Resilient and Reliable Systems
- Educational Benefit
- Community Benefit
- Timescale
- Sustainably Financed

Three-Track Approach



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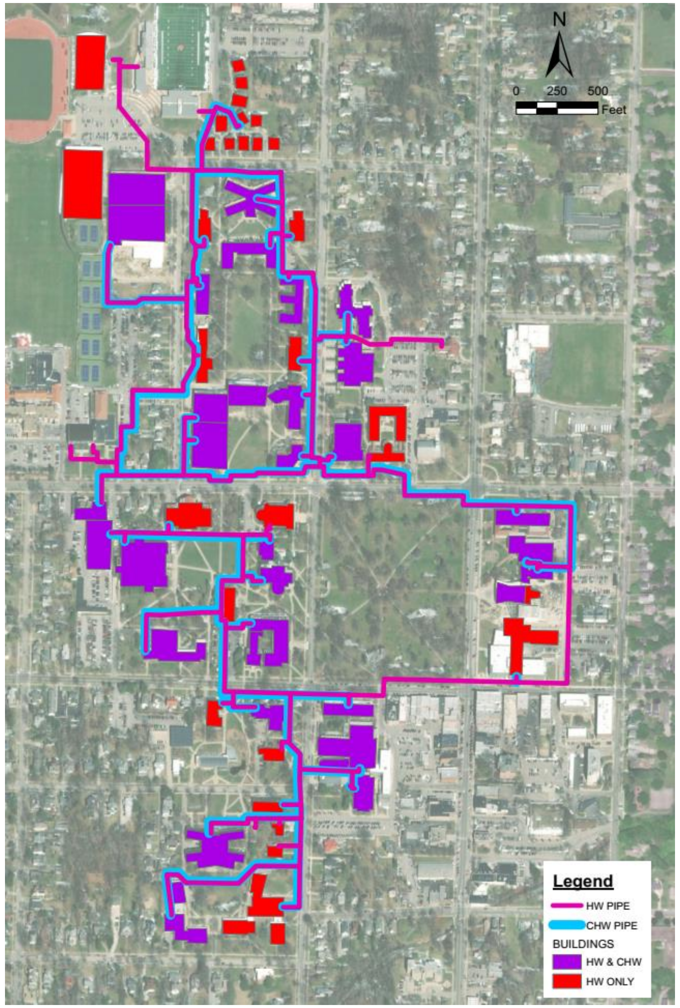
Three-Track Approach: Boiling it down to Three Fundamental Issues

Issue	Track	Board Support
1. How do we best address **the aged campus utility infrastructure** in a carbon neutral manner?	1	Approved Dec 2019
2. Which is the best **Organizational and Financing option** to implement this program?	2	Approved Dec 2020
3. Which C**arbon neutral source** solution(s) offer the greatest opportunity to meet program goals?	3	Pre-Approval Dec 2020 Complete Approval Target March 2021

Track 1: Steam-to-Hot Water Conversion & Chilled Water Growth



- Modernization of ~55 buildings
  - Hot water conversion
  - Equipment replacement/upgrades
- Expansion of cooling to 11 additional buildings
- Conversion of the central plant to simultaneous delivery of steam and HW

Track 2: Organizational & Financing Approach

- **Advisory Team:** Assembled a team of Financial, Legal, and Technical Advisors

- **Goal:** Explore, evaluate, and recommend a contract and delivery model that best meets the Sustainable Infrastructure Program objectives and priorities.

Primary College Objectives

The team's first-order priority was the development of clearly defined objectives and constraints

Service Transformation Objectives

- Modernization of utility system
- Accelerated delivery
- Sustainability goals / Carbon Free Resource
- Community benefit / participation
- Long-term control

Economic Objectives

- Budget neutrality / cost of service:
- Cost certainty
- Professionalize operations / Performance-based risk transfer

Evaluation: Organizational and Financing Options

- Preliminary prioritization of College objectives
- Identification and evaluation of contracting/delivery methods
- Preliminary risk assessment
- Preliminary legal and regulatory assessment
- Comparative analysis of delivery options
- Accounting Treatment
- Preliminary costing and financial modeling
- Finalize prioritization of College objectives
- Update costing and financial modeling
- Complete preliminary analysis
- Market sounding

Spectrum of Delivery Options

Once the program objectives were clearly laid out, the team proceeded to identify the full spectrum of project delivery methods available to the College. Below is a summary of the core options evaluated.

Contracting / delivery option →	**Owned, Financed, & Controlled by College**		**Non-profit utility**	**Public-Private Partnership Models ("P3")**		
Contracting models	DBB/DB + Self-Performed O&M	DBOM	Transfer of Ownership / Operations + ESA	DBFOM – 501c3	DBFOM – Availability Payments	DBFOM - Monetization

** Acronyms: DBB = Design-Bid-Build; DB = Design-Build; DBOM = Design-Build-Operate-Maintain; DBFOM - Design-Build-Finance-Operate-Maintain*

Risk Allocation and Tax/Regulatory Assessment

Each delivery option was examined further as it pertains to risk allocation and tax and regulatory applicability. This analysis revealed that the DBOM alternative aligned most closely with the College's objectives.

Key Risk Assessment Items
1. Land Purchase and Site Risk
2. Design Risk
3. Environmental/Social Risk
4. Construction Cost Risk
5. Operating / Performing Risk
6. KPI / Sustainability Goals
7. Major Maintenance Risk
8. Demand Risk
9. Commodity Price Risk
10. Utility Rate Risk
11. Tax Risk
12. Early Termination Risk
13. Ohio Regulatory Applicability
14. Ohio Utility Excise Tax

Advisory Team Final Recommendation

- Design-Build-Operate-Maintain (DBOM) model has been identified as the delivery model best aligned to the College's project objectives.

Next Steps

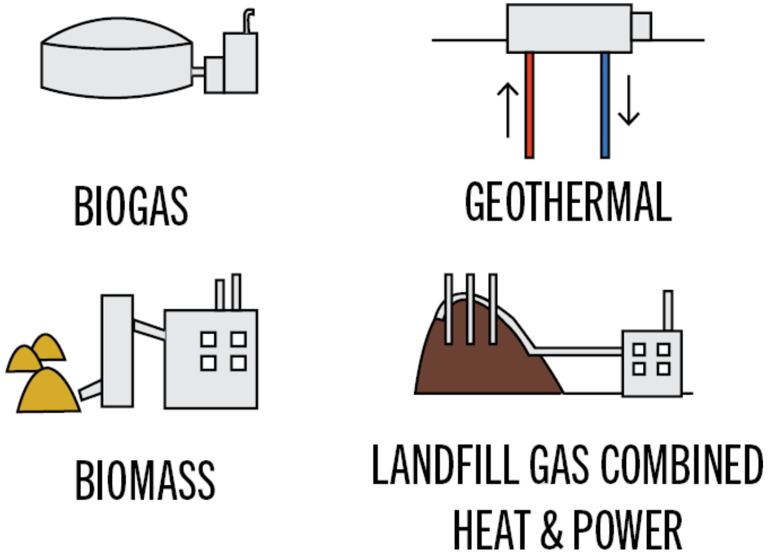
- Develop the comprehensive finance strategy to cover this utility modernization effort along with the housing plan to present to the Board Committees in Q1/Q2 2021.

Track 3: Carbon-Free Source Analysis - BAU

- For the comparison of alternatives, the business as usual (BAU) was considered the existing steam system with natural gas combustion, which were the conditions when this analysis was initiated.
- Two scenarios were considered as improvements without the integration of a renewable source:
  - Convert campus to hot water (180°F) with natural gas combustion
  - Convert campus to low temperature hot water (140°F) with natural gas combustion

Track 3: Carbon-Free Source Analysis - Alternatives

- Aquifer Thermal Energy Storage
- Biofuel
- Biogas
- Biomass
- Geothermal
- Variable Refrigerant Flow (VRF)
- Waste heat capture from a local power plant
- Solar PV with electric resistance heat and thermal storage
- Wind with electric resistance heat and thermal storage



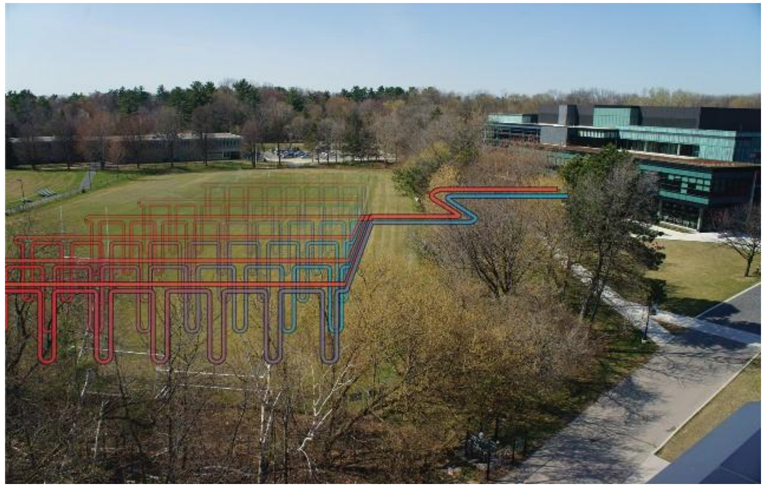
Narrowing the Options Down

Two of the options best met the program objectives for further investigation.

- Biomass
- Geothermal

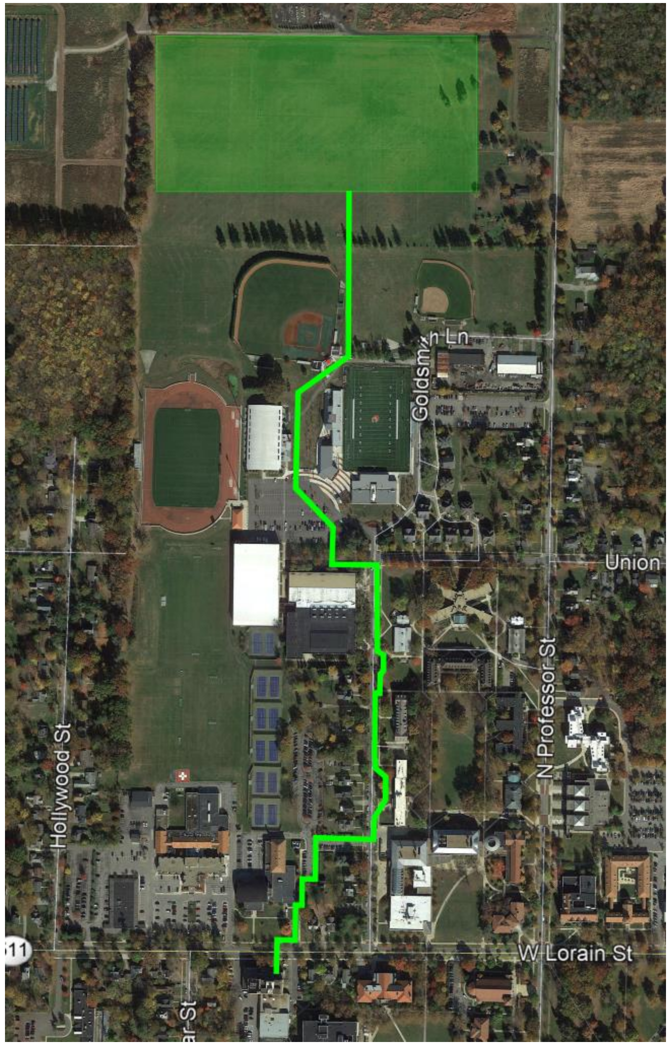
Each option was tested and presented in an optimized version, ultimately offering four (4) choices to consider.

- Biomass
- Optimized Biomass
- Geothermal
- Optimized Geothermal



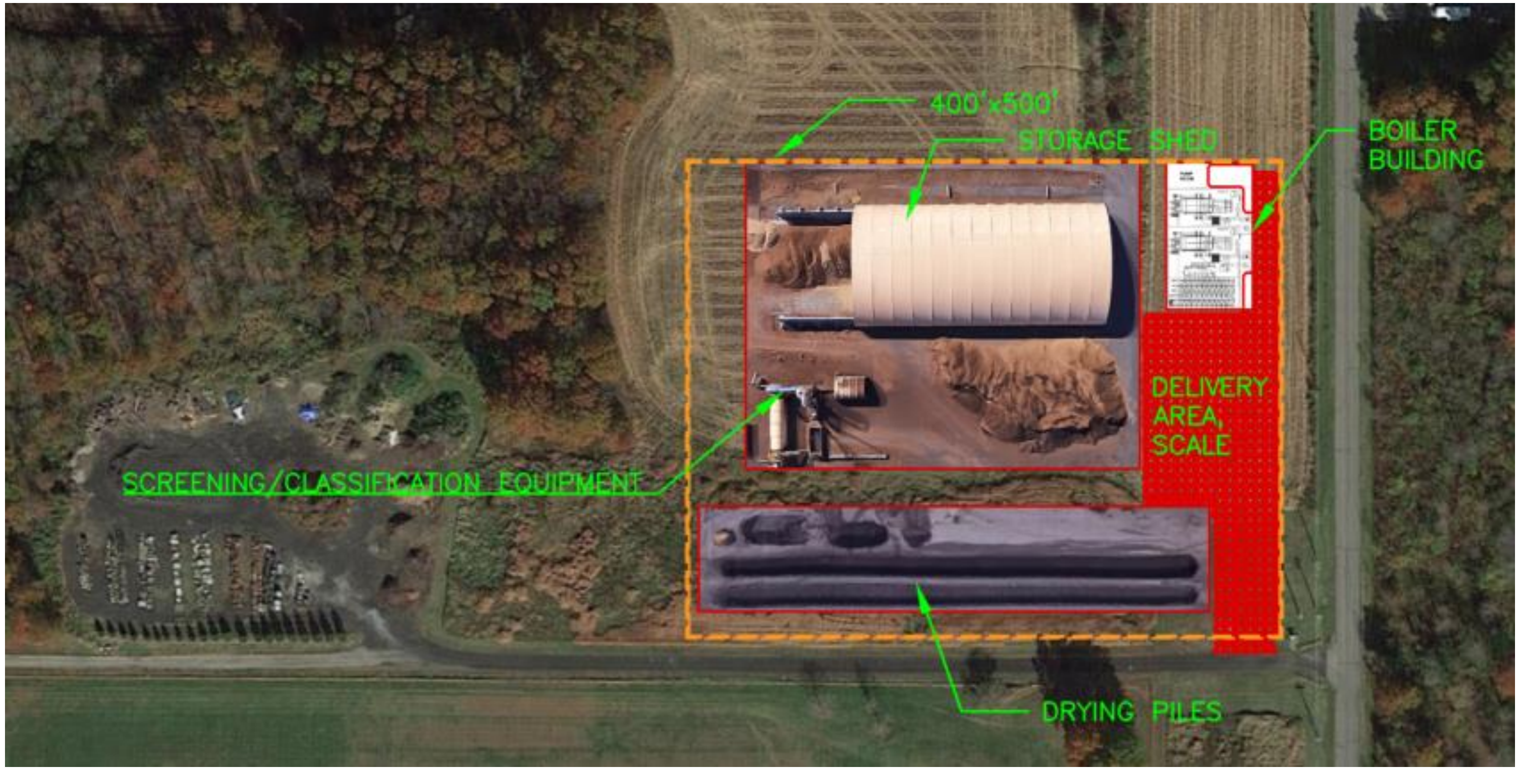
Proposed Geothermal Well Field

- Practice field disruption during construction
- Well field potentially trending cold
- Electrical infrastructure enhancement required
- Campus-wide geothermal vs. building-based geothermal

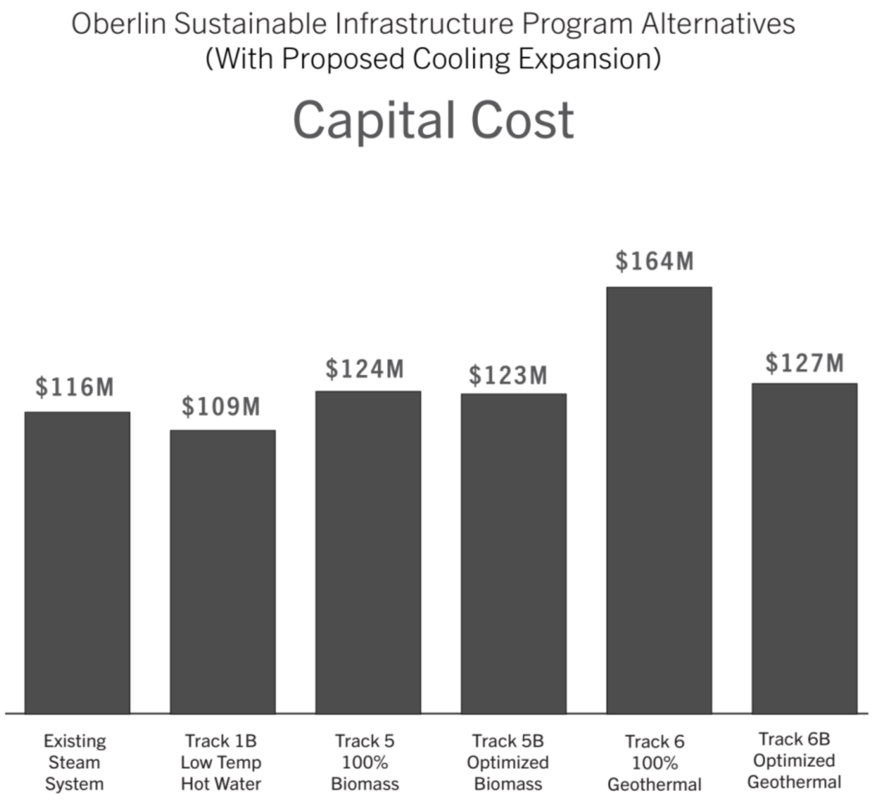


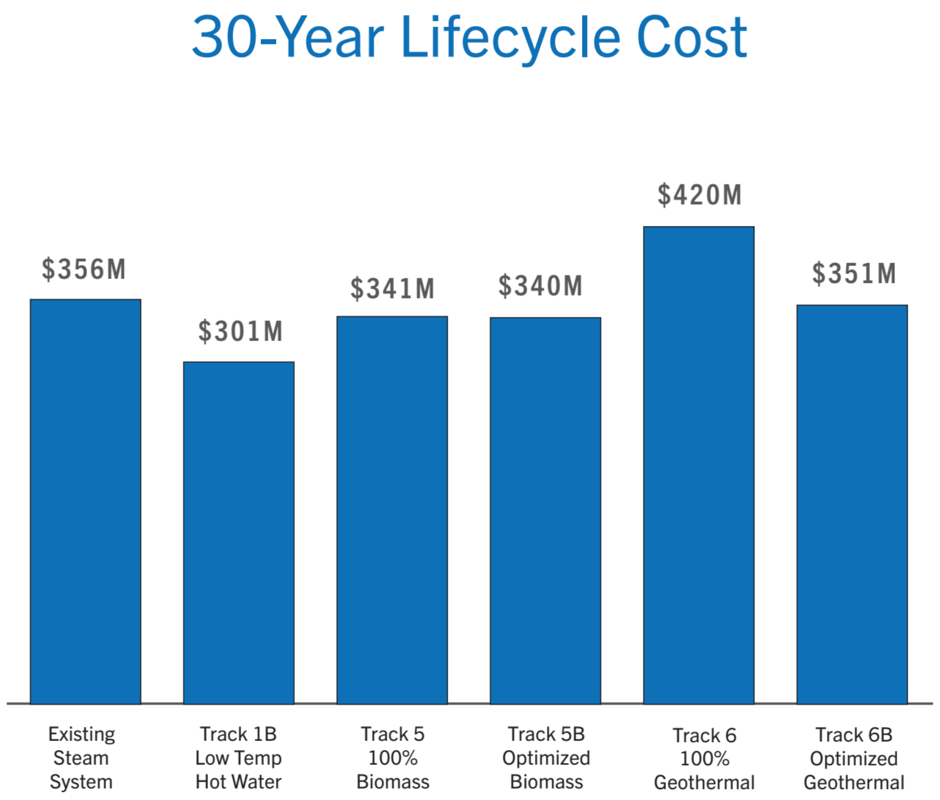
Proposed Biomass Facility

- Investment in local jobs
- EPA carbon-free designation
- Long-term supply
- Solid fuel combustion
- Increased truck traffic
- Air permitting process



Financial Analysis: 30-Year Life Cycle





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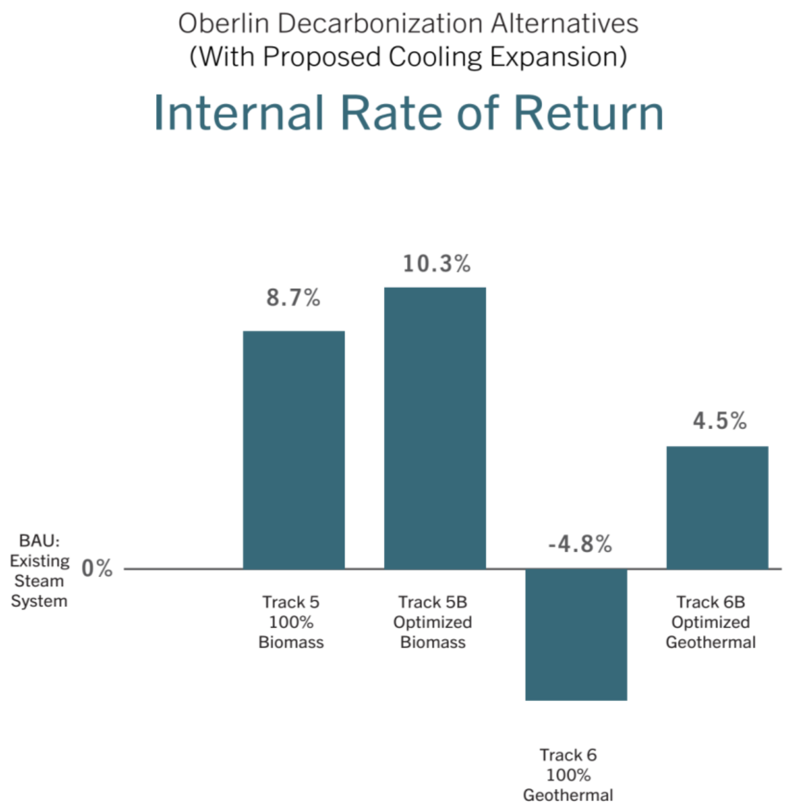

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Recommended Steps Forward

- Both optimized geothermal and biomass are implementable
- Both are projected to reduce Oberlin College's energy-related costs over a 30-year life-cycle
- Biomass does appear to be more cost-competitive, but the difference is minimal and the outlook for biomass carries more external risk.
- Geothermal risks are relatively minor, and should be able to be mitigated by OC.
- Geothermal can also be incrementally grown to serve additional load

Given these factors, Ever-Green recommends the selection of Optimized Geothermal as the decarbonization approach for Oberlin College.

Sustainable Infrastructure Plan Timeline

BOT Dec 2020

- Finalize Delivery Model
- Identify Funding for Design Engineering Work to get to construction
- Continue energy source evaluation
- Project Website Live

SIS Dec 2020

- Finalize Delivery of Alternative Energy Source

BOT March 2021

- Present Comprehensive Financial Strategy
- Review Sustainable Infrastructure Program Schedule
- CPC Finalize Energy Source Choice

Construction

4 Year

2020

2021

May 2021 Begin Construction

Q1 2021

- Reach 30%/60% Design completion for buildings, distribution network, and central plant conversion
- Begin comprehensive financial strategy

Q2 2021

- Secure construction management team
- Permitting
- Reach 90% Design Completion for buildings, distribution network, and central plant conversion

Achieving Carbon Neutrality at Oberlin College

Reducing current scope 1 and 2 carbon emissions by 73%, with a 92% reduction from the 2007 baseline.

- Annual water reduction of 7.5 million gallons.
- Annual sewer discharge reduction of 5.8 million gallons.
- Providing district energy options to local businesses, non-profits, and community members

Predicted GHG savings

300,000 tons
of CO2 savings
over 30 years

92% reduction
of CO2 emissions
from 2010 baseline

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