2025

REBUILD

CONFERENCE

Miami University's Approach to Resilience and Sustainability

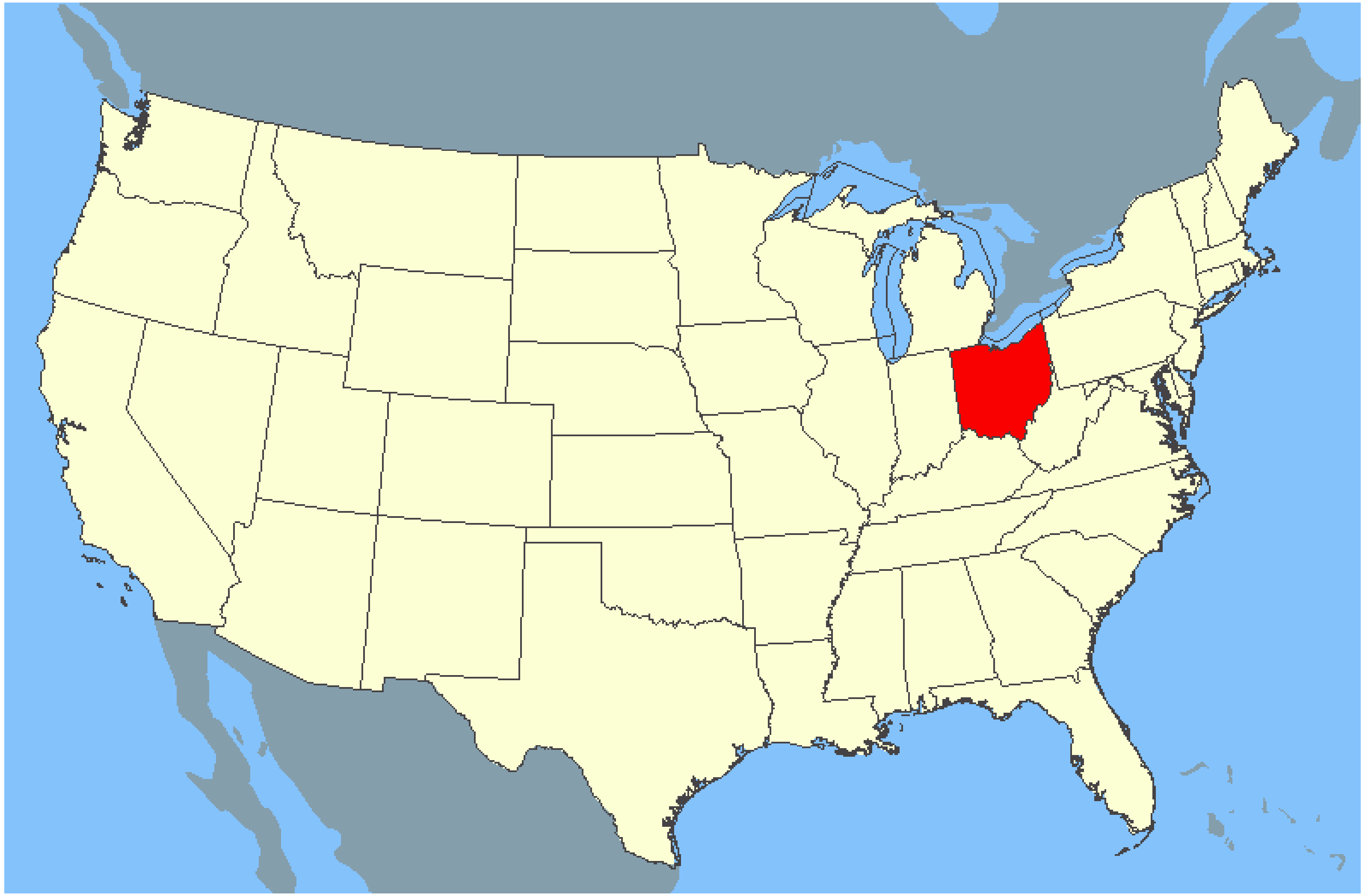
About Miami University

- **Public university established in 1809**
- **Receives less than 8% of funding from state (49% in 1970)**
- **Main campus in Oxford, OH**
  - Regional campuses in Hamilton, Middletown, West Chester & Luxembourg
- **Main campus has 16,812 undergraduates, 2,022 graduate students (2024)**
- **2,500 acres, 8.4 million gross square feet of buildings**
  - 1,000 acres preserved as natural areas in perpetuity
  - 76 acres of parking spaces
  - 32 miles of walkways
  - 5.4 miles of utility tunnels
- **Focus on LEAN Management**

Resiliency @ Miami University

- Climate
- Disaster
- Economics
- Demographics

Opportunities

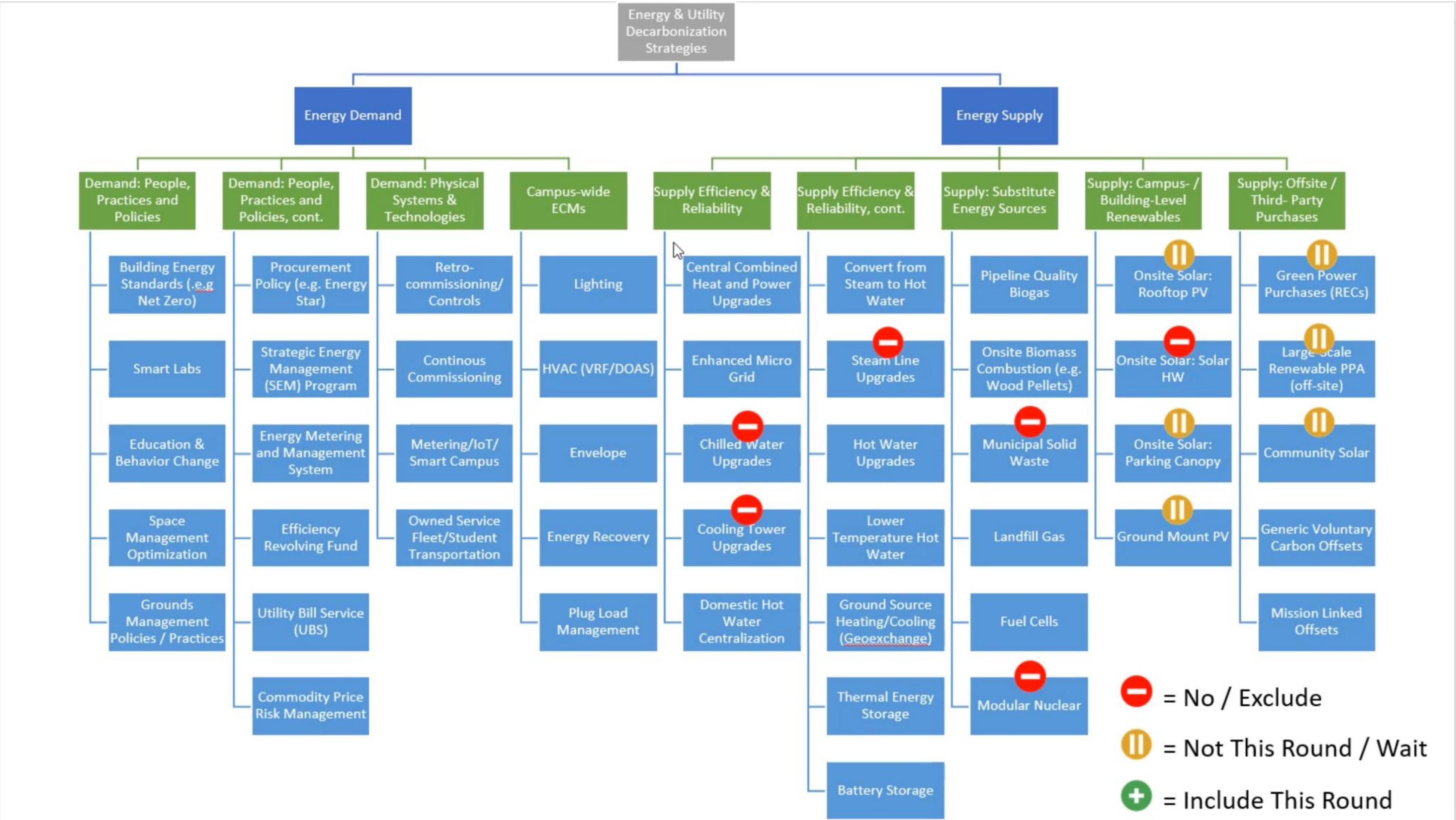


Opportunities for Change

Development of long-range housing and dining plan

- 15-year plan, 2011-2026
- 7,000 beds in 2010
- Need to grow to 8,000 beds
- 50% of campus square footage
- Majority 50’s and 60’s construction
- Needed to create swing space to avoid revenue hit

Opportunities for Change



Utility Master Plan Strategy

- Miami's utilities master plan (UMP) is shifting our campus from steam generated from burning fossil fuels (natural gas and coal) to heat pumps and geothermal (electric).

- Relying on electricity as "fuel" gives Miami flexibility in how the electricity is purchased and produced. The flexibility gives Miami greater control in managing the cost over time.

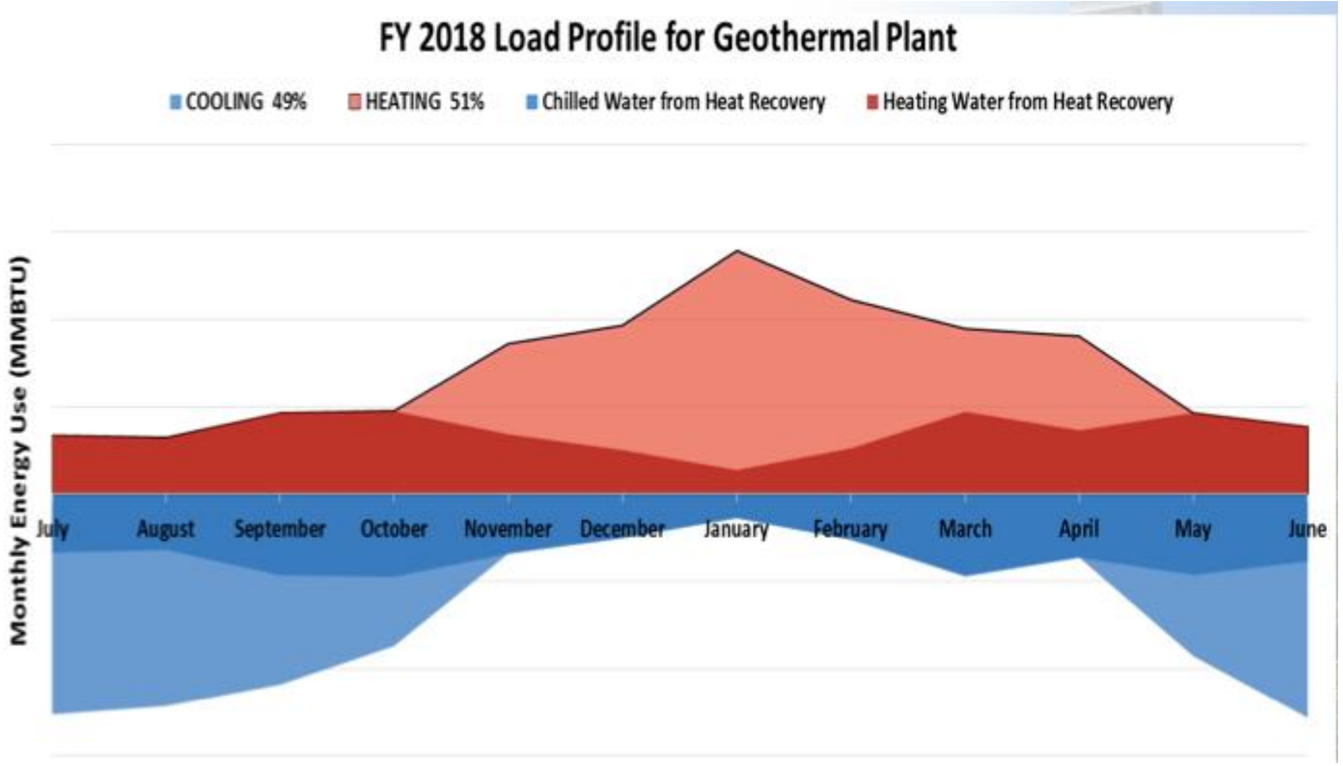
- The UMP has focused on solutions that reduce energy consumption and operating costs, while converting our infrastructure systems to more robust, reliable and flexible energy sources.

- "Electrifying" the campus requires careful consideration to diversify electricity sources for the purpose of reliability and cost control.

Utility Master Plan Strategy

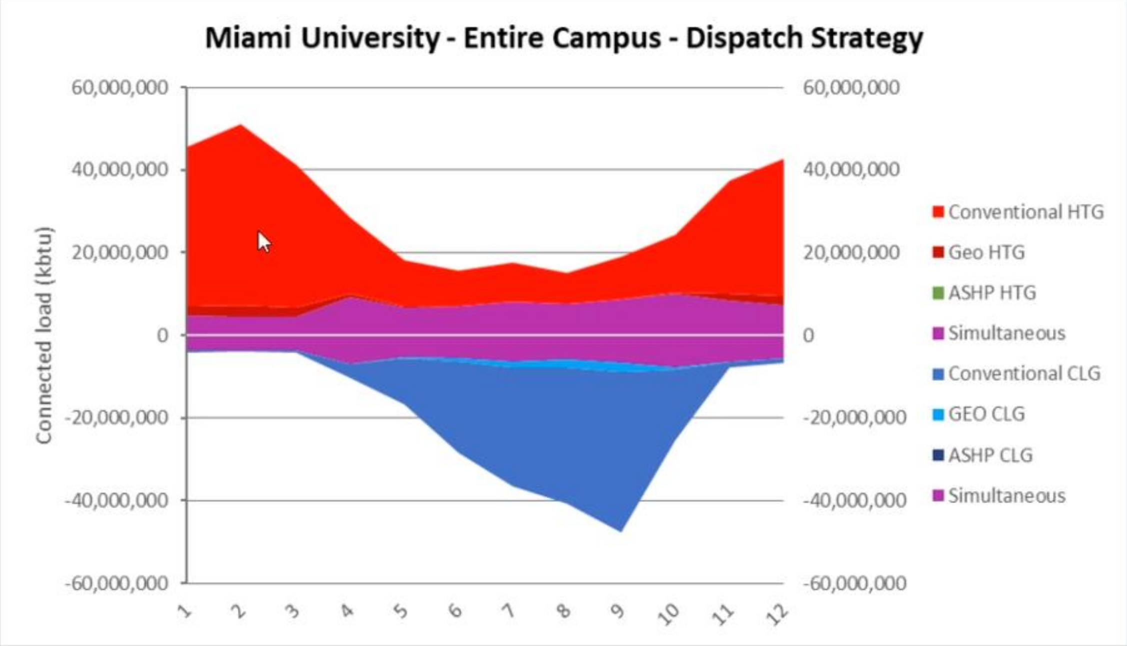
UMP Expected Outcomes

- **Customer Focus**
  - N+1 redundancy reliability
  - Year round cooling and heating availability
  - Aesthetically pleasing
- **Safety**
  - Migration to heating hot water is safer than steam, both from a property/personnel standpoint.
  - Chemical handling risk reduced.
- **Productivity**
  - Labor efficiency improvements
  - Overall energy efficiency improved, up to 600% in heating with geothermal
  - Carbon reduction
- **Cost**
  - Water usage minimized
  - Chemical usage minimize
  - Less environmental regulation and compliance
  - Flexibility for fuel (sourcing) options

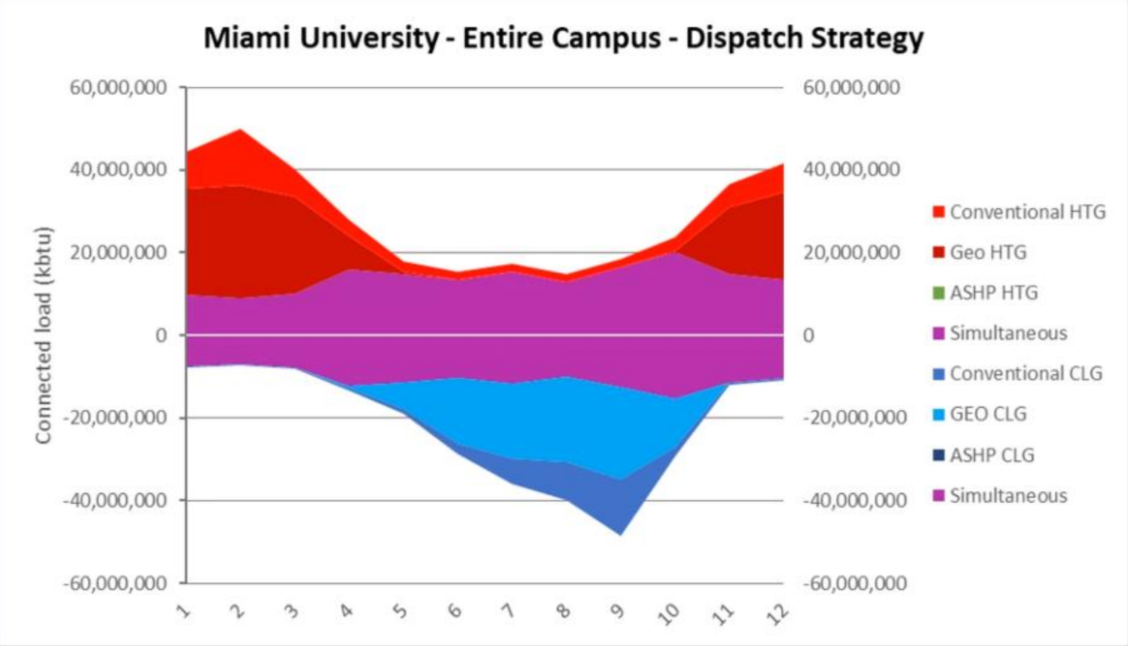


Utility Master Plan Strategy

BAU

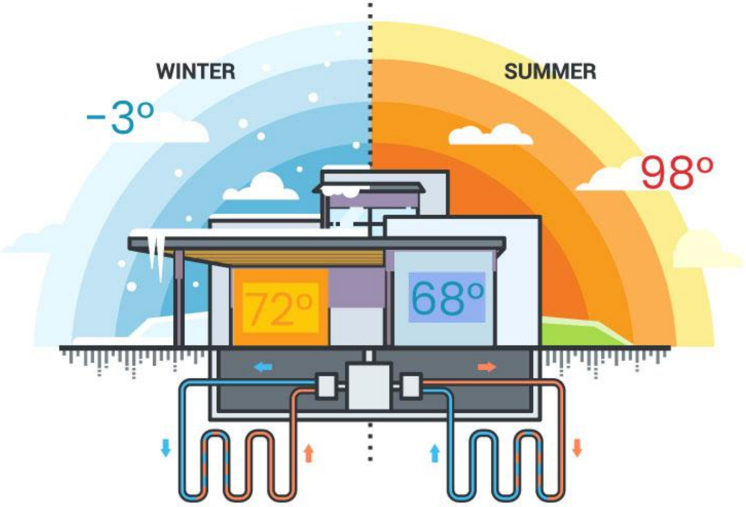


Long Term + Added Bores

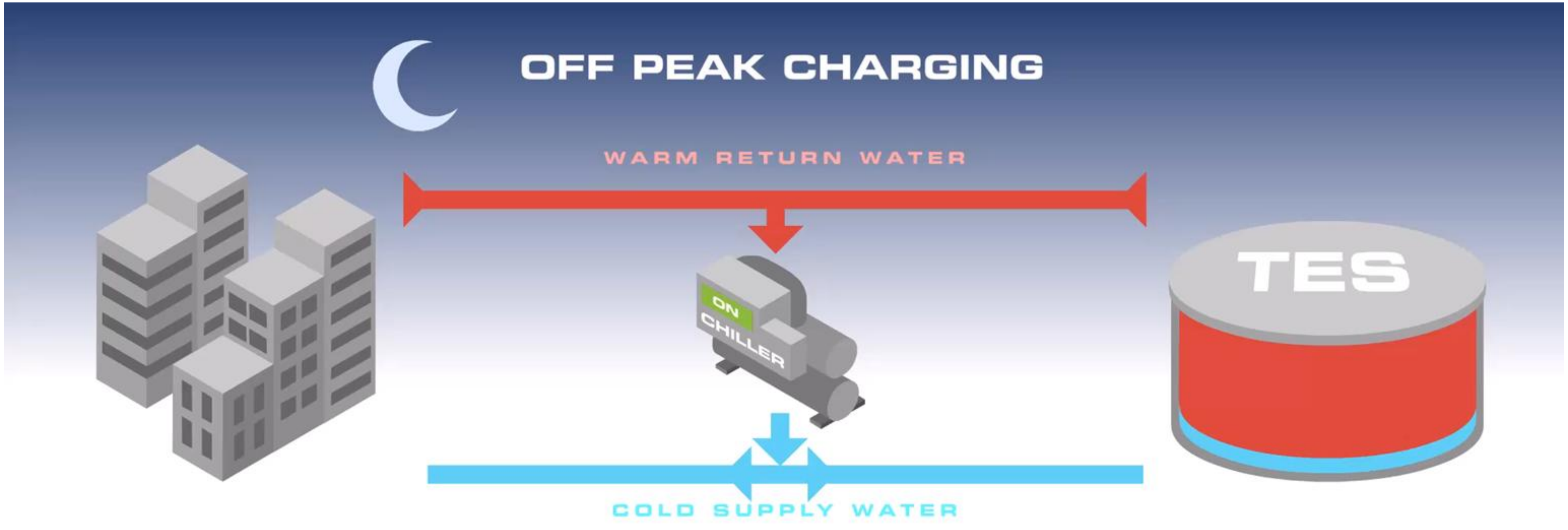


What is Geothermal Ground Exchange?

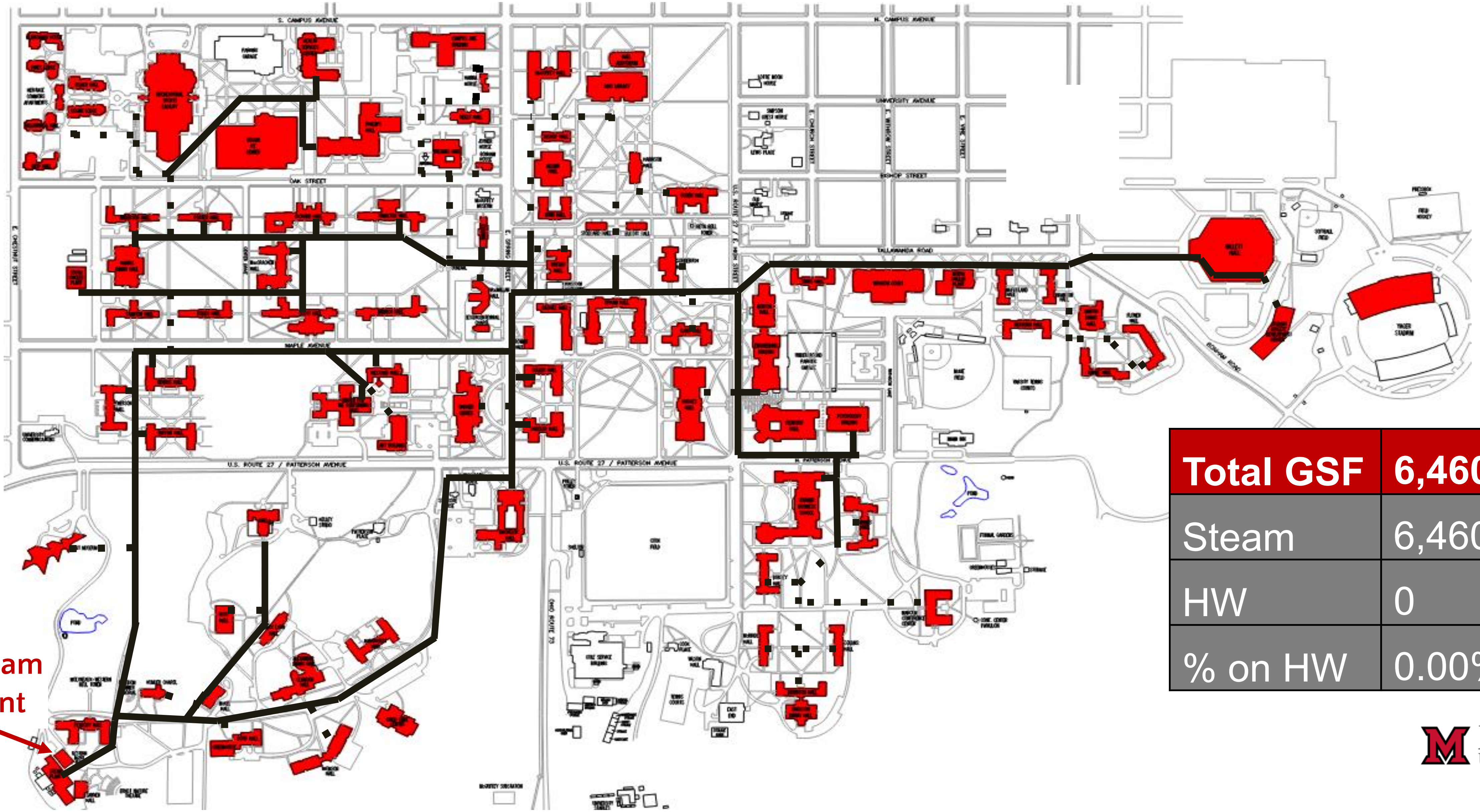
Using the earth as a thermal battery to store heat extracted from buildings in summer to be repurposed in winter.



Thermal Energy Storage (TES) Technology



2010 Steam Heated Buildings

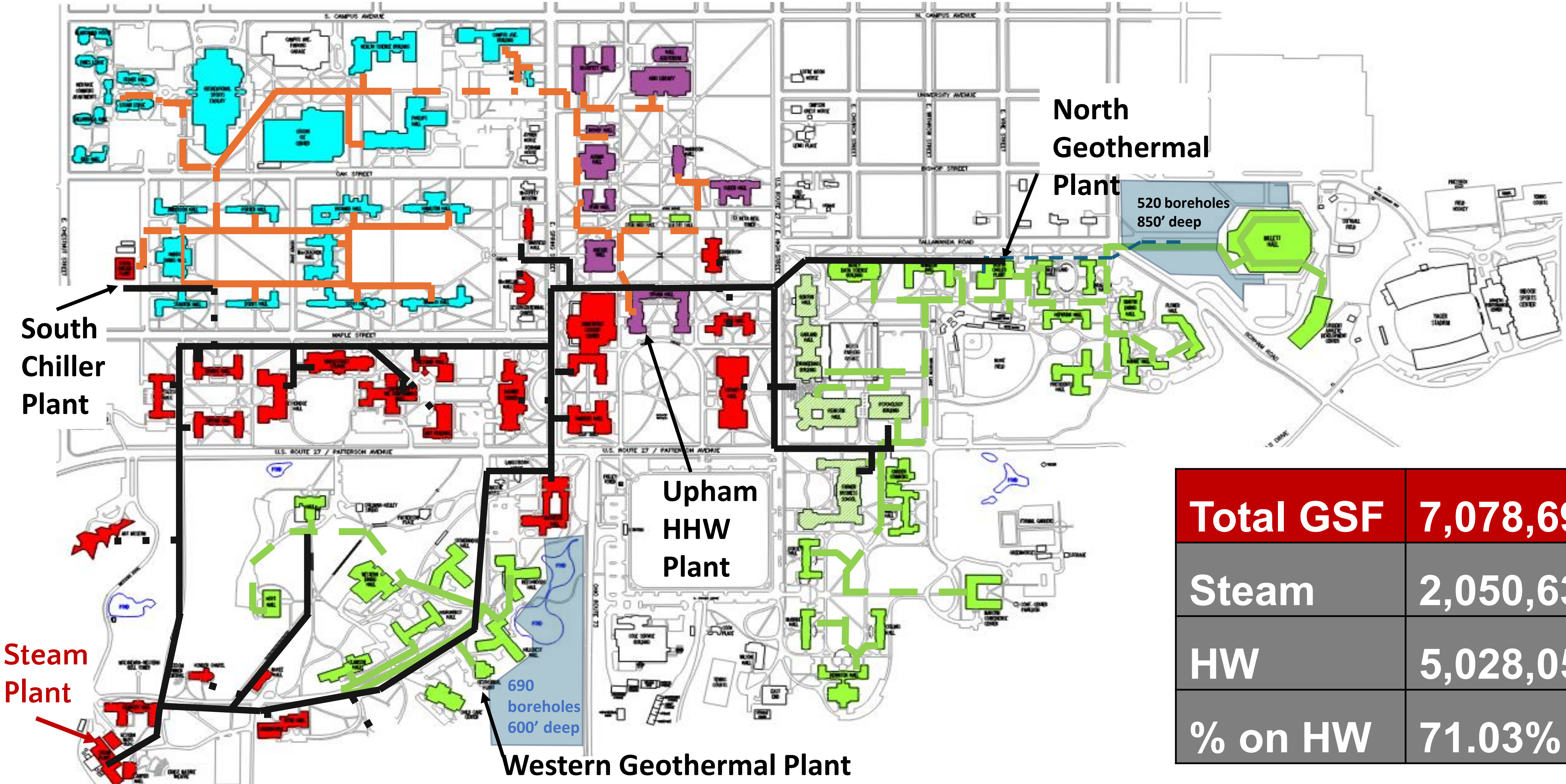


Steam Plant

Total GSF	6,460,224
Steam	6,460,224
HW	0
% on HW	0.00%

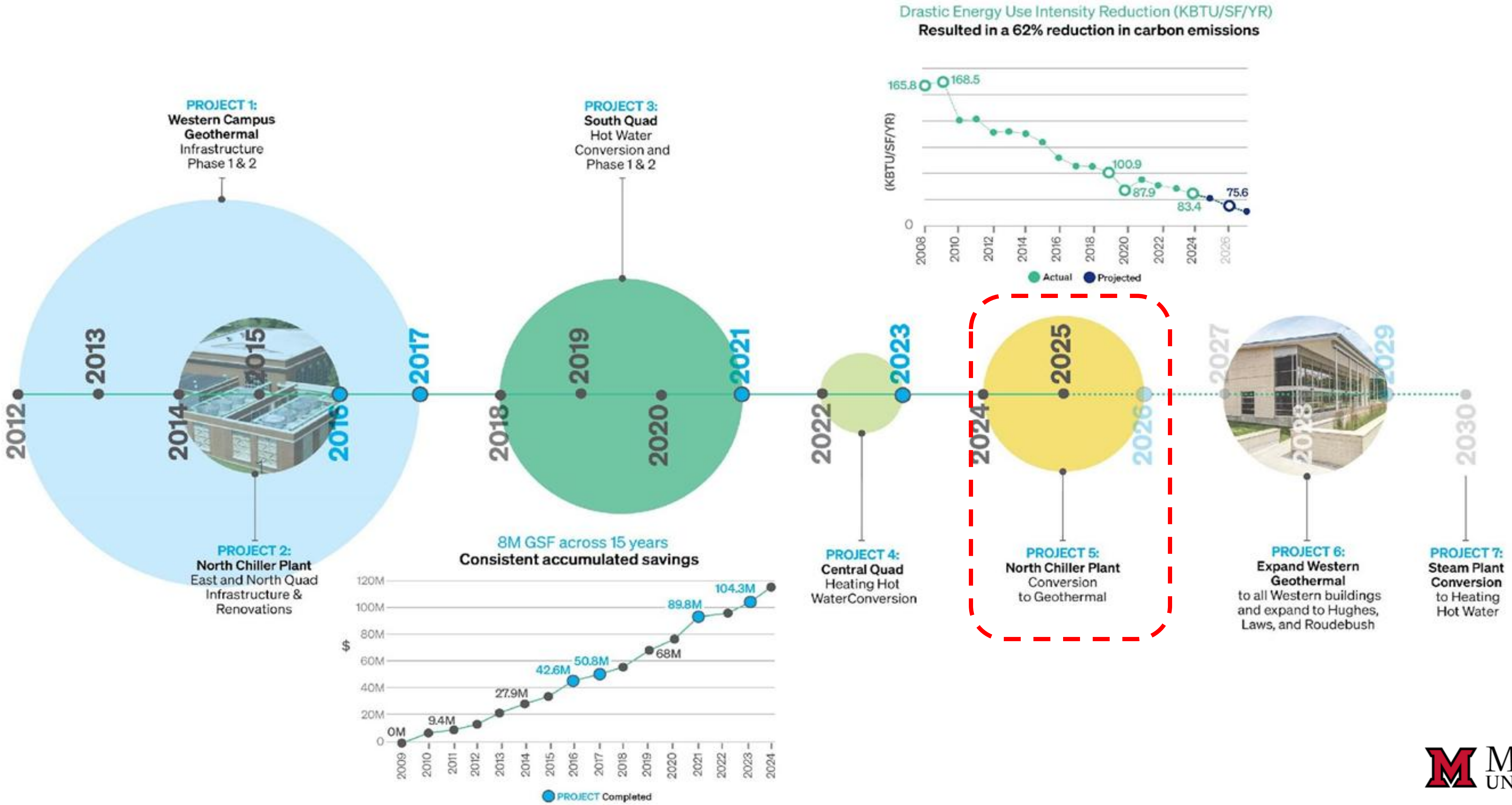
MIAMI UNIVERSITY

2024-26 Steam & Heating Water Buildings

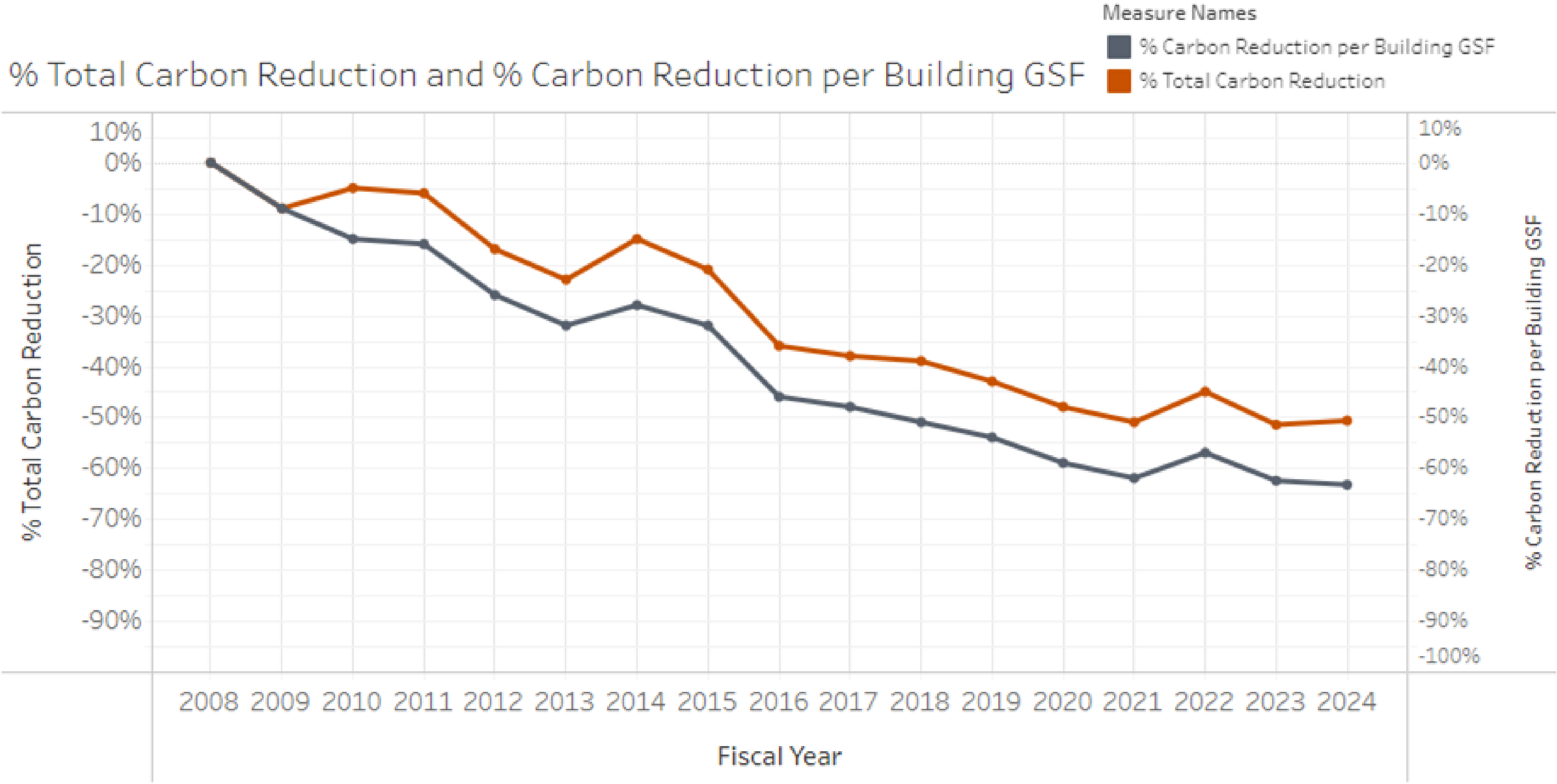


Total GSF	7,078,691
Steam	2,050,635
HW	5,028,056
% on HW	71.03%

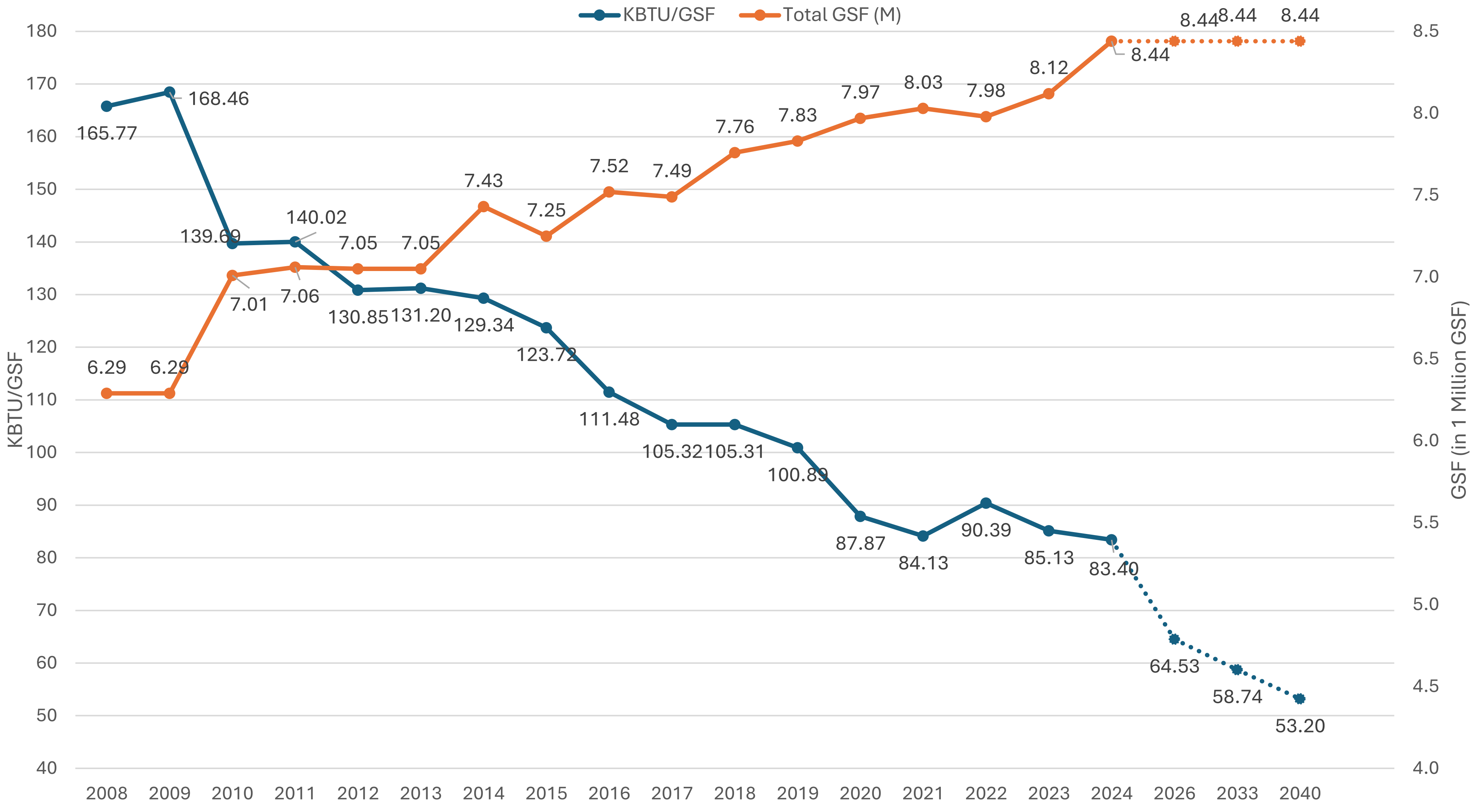
Energy Transformation Timeline



Carbon Reduction MTCO2e/GSF



Kbtu/gsf progress chart



Key Points of Heating/Cooling plan

- Convince administration to focus on long-term savings
- Savings to be rolled into CR&R to pay for future projects
- Coordinate with campus capital building plans
- Set building standards (i.e. HW max temperature 130 °F)
- Build out the HW distribution network
- Take advantage of simultaneous heating & cooling, leverage existing CHW infrastructure
- Defer capital cost expenditures on LTHW building conversion via use of an outside air hot water reset schedule
- Repurpose steam lines for heating hot water

Rainbow Chart – Roadmap for Operation Managers

[Blue] Peak Shaving

- Peaking engine generators: (2) 5.7MW natural gas reciprocal
- TES tank (thermal energy storage)

[Orange] PLC (peak load contribution)

- Peaking engine generators: (2) 5.7MW natural gas reciprocal
- TES Tank (thermal energy storage)
- Load curtailment with BAS (building automation system)

[Green] Generate for Dollars

- Generate when RT LMP prices spike
- Reduce nomination and generate when anticipate high DA
- Price sensitive demand bid

NAME OF PROGRAM	PEAK SHAVING - WINTER	AEP PRICE - CONDITIONAL AGREEMENT	PLC - SUMMER	PEAK SHAVING - SUMMER
ALTERNATE FORMAL NAME	Duke Load Management Riders	GENERATE FOR PROFIT	PEAK LOAD CONTRIBUTION	Duke Load Management Riders
SPONSOR	DUKE ENERGY	AEP Eenrgy	PJM	DUKE ENERGY
INTENT	To limit demand during winter on-peak hours to reduce Duke monthly demand bill	To generate power when Day Ahead (DA) price is higher than $75/MWH for 3 consecutive hours	To limit campus Total Import on the 5 highest hours on separate PJM demand days during summer peak months	To limit demand during summer on-peak hours to reduce Duke yearly demand ratchet and monthly demand bill.
START DATE	30-Sep	1-Jun	29-May	29-May
END DATE	28-May	28-May	29-Sep	29-Sep
CONTROL HOURS/DAYS	12 / Monday thru Friday	24 / 7 DAYS A WEEK	4/ Monday thru Friday	9 / Monday thru Friday
PROGRAM START TIME	9:00 AM / 9:00:00	9:00 AM / 9:00:00	2:00 PM / 14:00:00	11:00 AM / 11:00:00
PROGRAM END TIME	9:00 PM / 21:00:00	9:00 PM / 21:00:00	6:00 PM / 18:00:00	8:00 PM / 20:00:00
TRIGGER OF EVENT	When MU operating engineer determines Total Import load is approaching 15,000 kVA during control period	SR.ELEC.OPS.MGR call by 9AM morning of to run based on day ahead price.	SR.ELEC.OPS.MGRcall to run based on PJM hourly load forecast over 138,000 MW	When MU operating engineer determines Total Import load is approaching 15,000 kVA during control period
RUN ORDERS	GOAL: IMPORT to 15,000 kVA Operate Wartsila Gens and Thermal Storage to limit Total Import.	GOAL: IMPORT to set kW Operate both Wartsila Gens to reduce load.	GOAL : IMPORT to 1,000 kW Operate Wartsila gens to max output, operate Detroit gens to max output synchronized to utility and PLC LOAD SHED PLAN on campus. DO NOT EXPORT.	GOAL: IMPORT to 15,000 kVA Operate Wartsila Gens and Thermal Storage to limit Total Import.
MONITORING POINT	Power Monitoring KVA	Power Monitoring KW	Power Monitoring KW	Power Monitoring KVA
MONITORING METHOD	15 minute block average	One hour block average	One hour block average	15 minute block average
FINANCIAL IMPACT FOR FAILURE TO MEET LEVELS	~$1,500 / 1,000kW	VARIES: ~$150 / 1,000kW	~$100,000 / 1,000kW	~$7,500 / 1,000kW

DR (demand response, e.g. PowerShare Program)

- Utilize generators, TES, and BAS to reduce load to set amount
- Based on NSPL Network Service Peak Load

Solar Field

Approximately 2,000 Megawatt hours annual electricity production

Geothermal Site

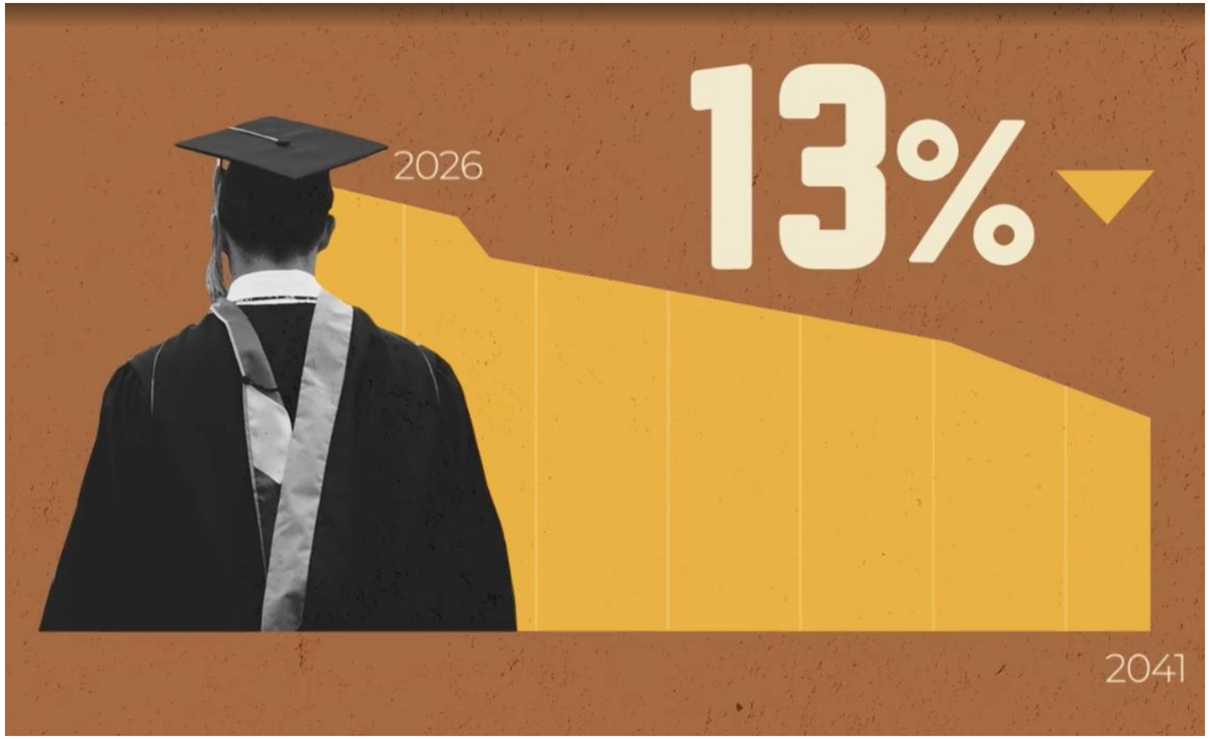
- Size: 2.26 Acres
- Panels: 1,800 total panels installed
- Mounting system: Ballast (on top of the ground)

Thomson Hall Site

- Size: 1.87 Acres
- Panels: 1,536 total panels installed
- Mounting system: Screw Type anchor

Sharon & Graham Sustainability Park

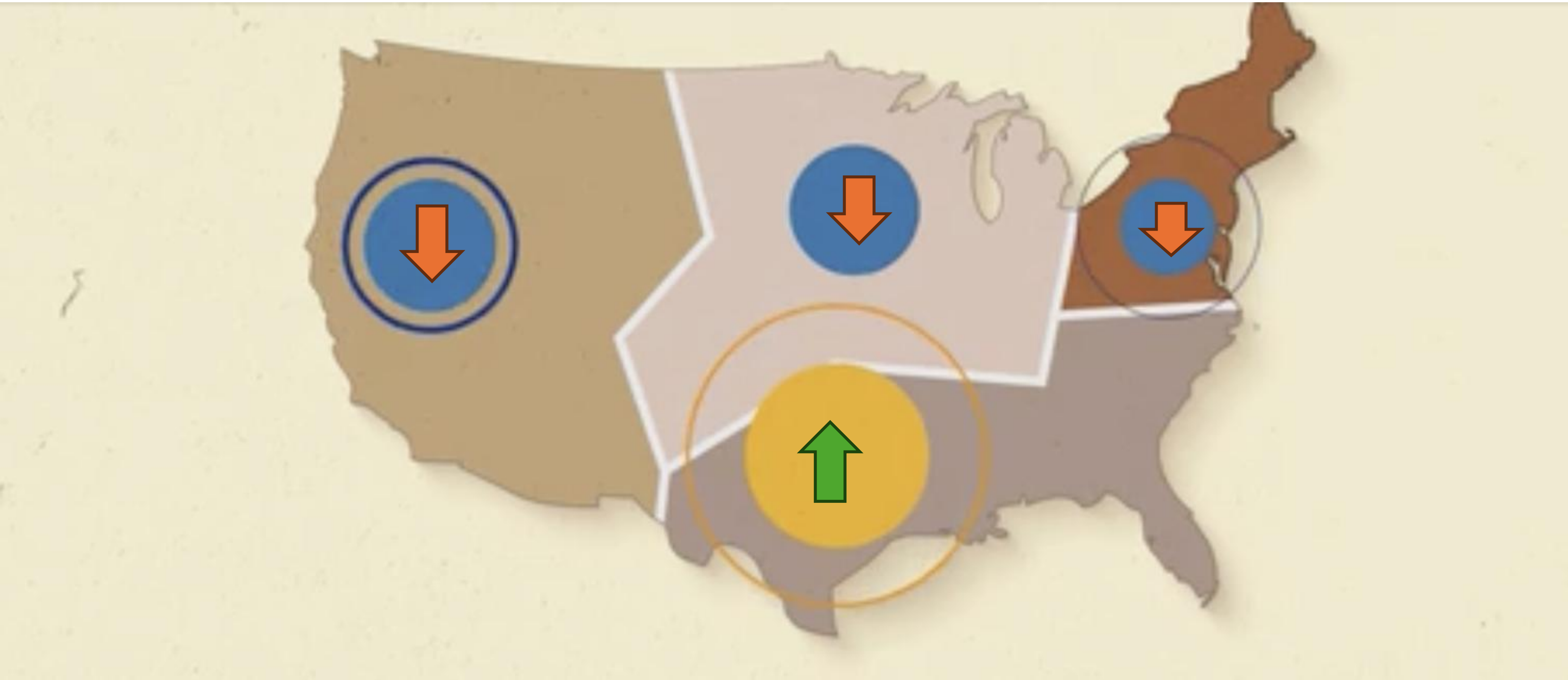
Pressures on Higher Education



(Chronical of Higher Ed, 2025)

- **Declining number of high school students**
- **Higher cost of enrollment for families**
- **Higher cost of financial aid for institutions**
- **Declining perceived value of Higher Ed**
- **Political / Social policies**

Pressures on Miami University



(Chronical of Higher Ed, 2025)

- Location
- Recruitment areas

Miami University' Response

Miami THRIVE

Transform our university

Honor our mission

Realize our potential

Innovate programs and offerings

Value our people

Embrace excellence

- URBAN BRIDGES: Expand our offerings of experiences to urban centers
- CAPTURING UNTAPPED AUDIENCES: Recruiting beyond traditional regions