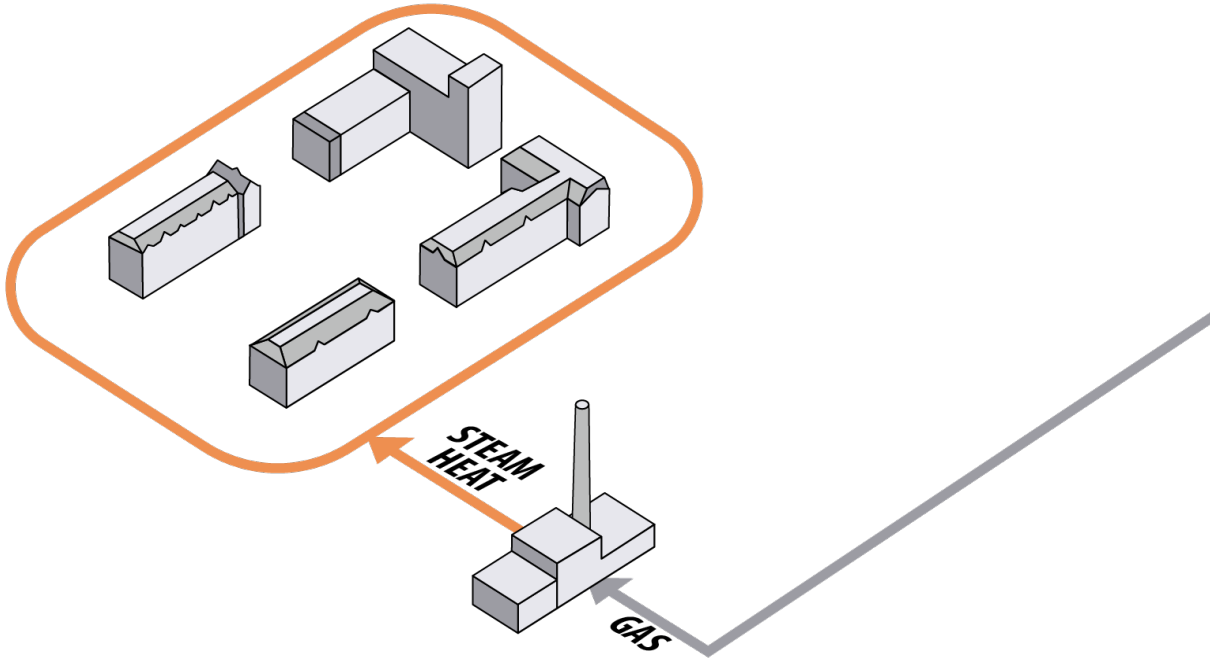
UW ENERGY STRATEGY

DECEMBER 2022

BE BOUNDLESS

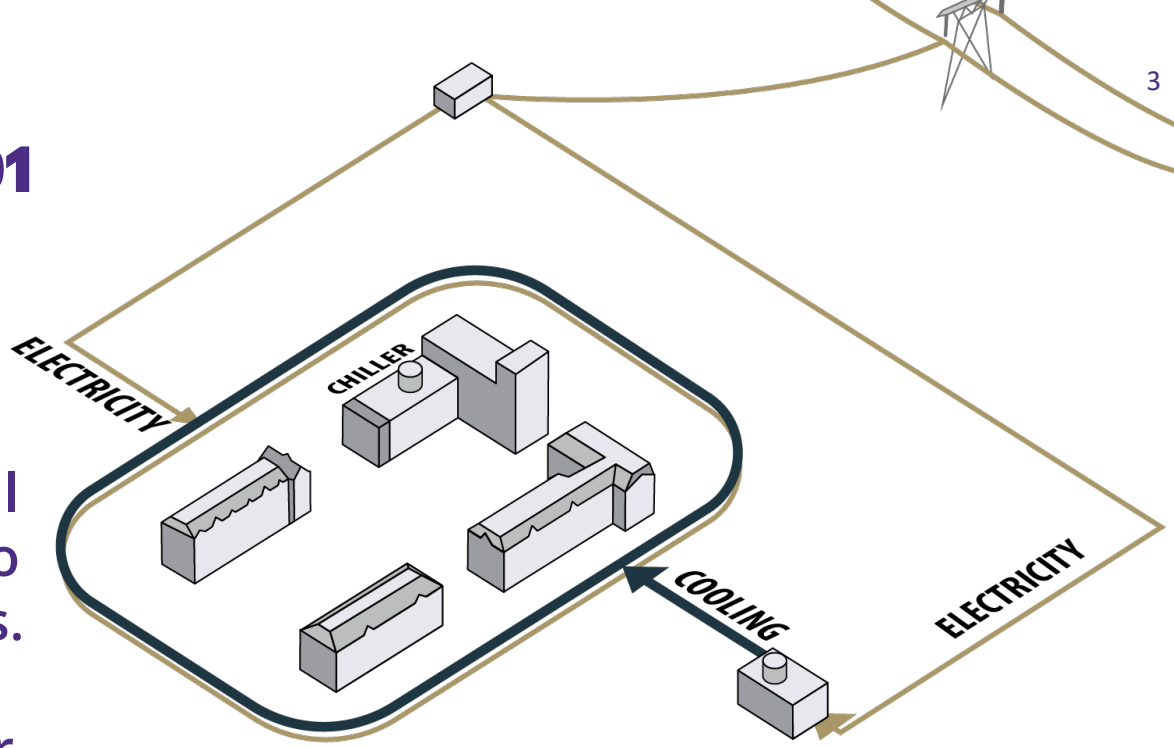
UW HEATING 101

To heat buildings, we burn natural gas to create steam at our central plant and send it to buildings in tunnels.



UW COOLING 101

To cool buildings, we run electric chillers at our central plant to chill water and send it to buildings in tunnels. In addition, many buildings have their own chillers.



TIME FOR TRANSFORMATION

This heating & cooling system has served the campus well, but we face challenges and opportunities that compel us to transform this system into something even better.

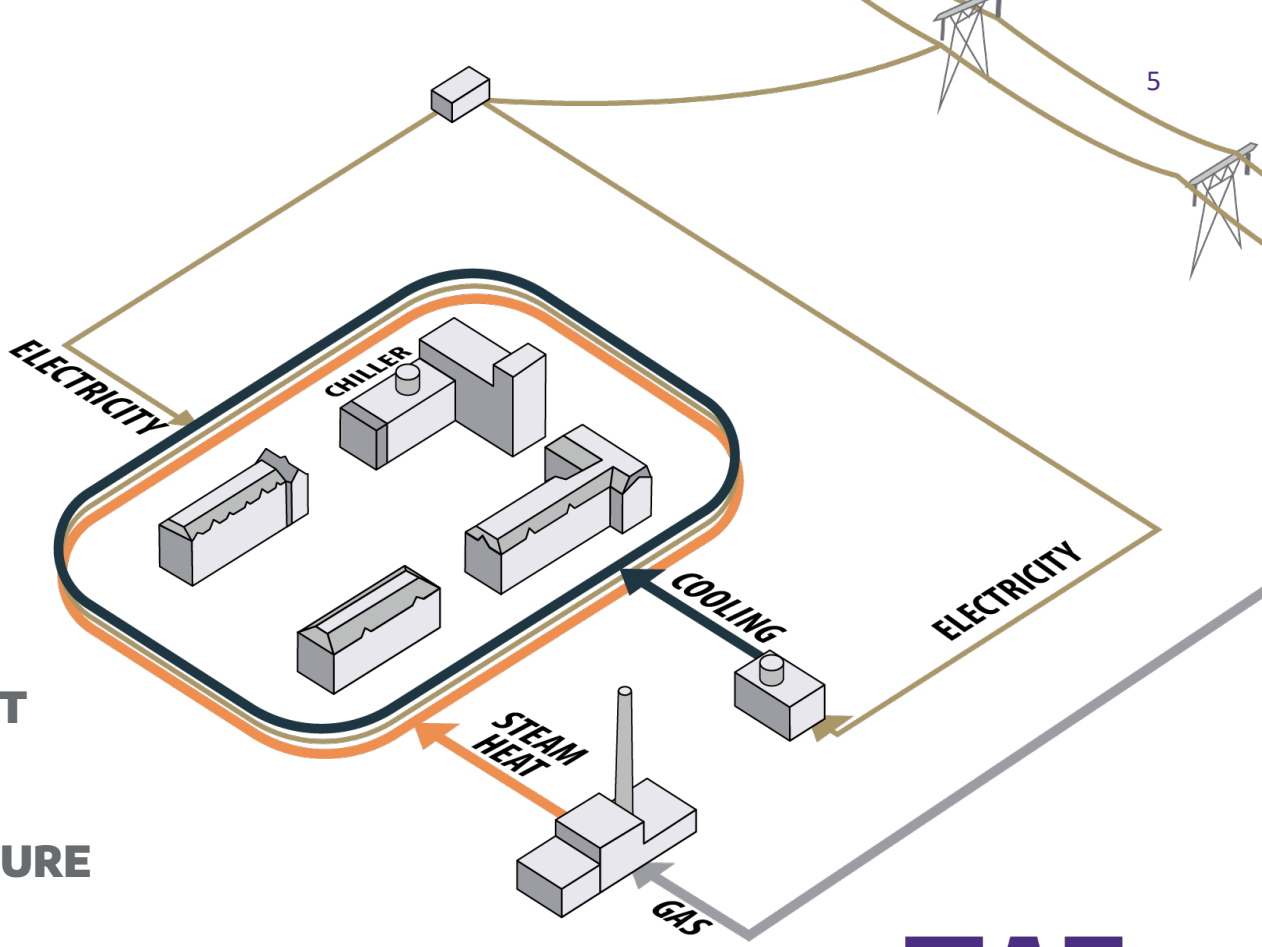
CHALLENGES

GREENHOUSE GAS EMISSIONS

ENERGY EFFICIENCY

ELECTRICAL CAPACITY CONSTRAINT

AGING UTILITY INFRASTRUCTURE



ENERGY TRANSFORMATION STRATEGY

ENERGY
SYSTEM ISSUES

Greenhouse Gas Emissions

Energy Consumption

Electrical Capacity Constraint

Aging Utilities Infrastructure

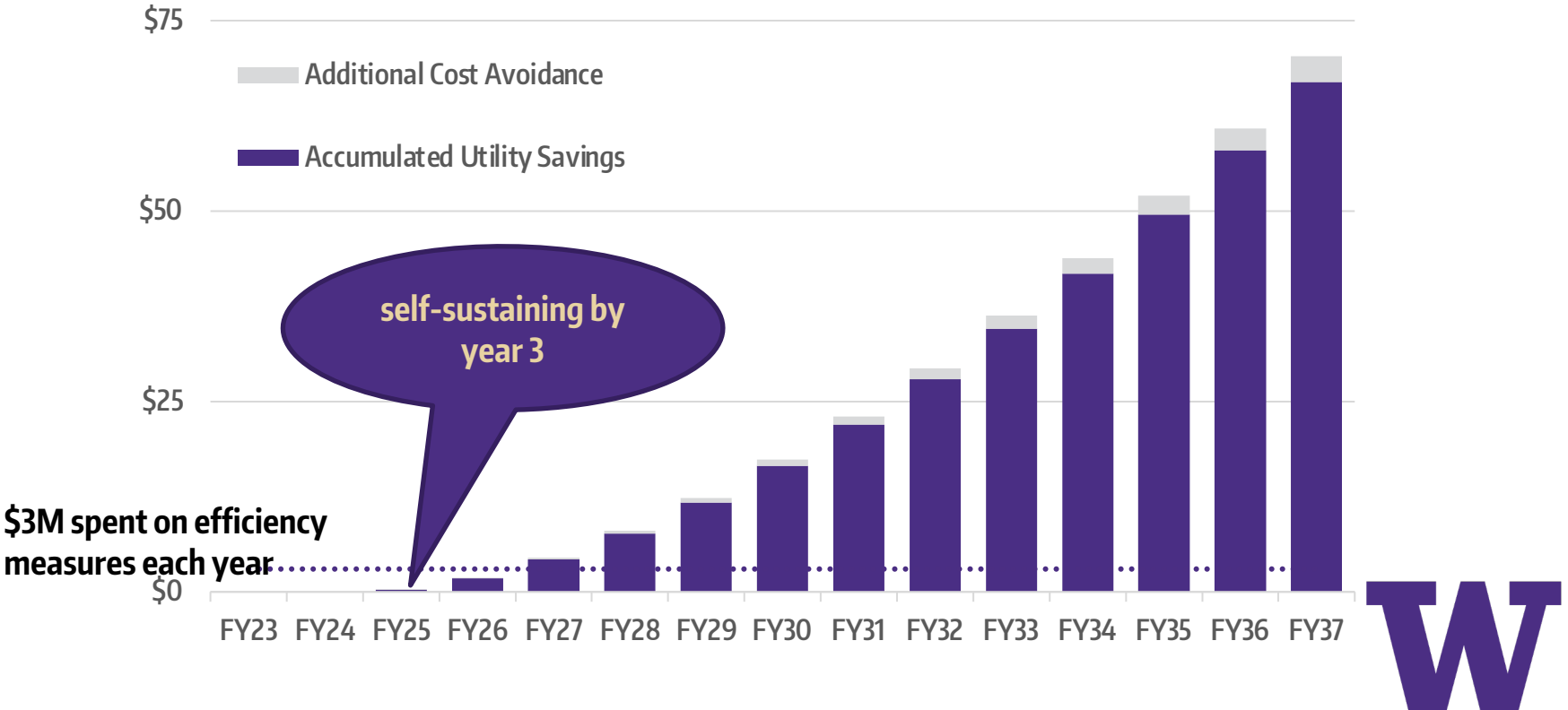
ENERGY TRANSFORMATION STRATEGY

ENERGY SYSTEM ISSUES	ENERGY EFFICIENCY 1
	Expand metering, upgrade controls, data analytics and green revolving fund.
Greenhouse Gas Emissions	**15%** reduction in GHGs
Energy Consumption	**30%** energy reduction
Electrical Capacity Constraint	**2%** more capacity
Aging Utilities Infrastructure	✓

PHASE 1 of the strategy focuses on making our buildings more efficient through:

- Expand Metering
- Upgrade Controls
- Establish Data Analytics
- Fund Efficiency Upgrades with Utility Savings

UTILITY SAVINGS FROM EFFICIENCY



ENERGY TRANSFORMATION STRATEGY

ENERGY SYSTEM ISSUES	ENERGY EFFICIENCY 1 *Expand metering, upgrade controls, data analytics and green revolving fund.*	CONVERT TO HOT WATER 2 *Convert from steam to hot water heating.*
Greenhouse Gas Emissions	**15%** reduction in GHGs	**20%** reduction in GHGs
Energy Consumption	**30%** energy reduction	**20%** energy reduction
Electrical Capacity Constraint	**2%** more capacity	**2%** **less** capacity
Aging Utilities Infrastructure	✓	✓

PHASE 2 enables phases 3-5

- Convert from Steam to Hot Water Heating

ENERGY TRANSFORMATION STRATEGY

ENERGY SYSTEM ISSUES	ENERGY EFFICIENCY 1 *Expand metering, upgrade controls, data analytics and green revolving fund.*	CONVERT TO HOT WATER 2 *Convert from steam to hot water heating.*	CENTRAL COOLING 3 *Replace inefficient chillers, use lake water for cooling, and add thermal storage.*
Greenhouse Gas Emissions	**15%** reduction in GHGs	**20%** reduction in GHGs	no additional reduction
Energy Consumption	**30%** energy reduction	**20%** energy reduction	**10%** energy reduction
Electrical Capacity Constraint	**2%** more capacity	**2%** **less** capacity	**25%** more capacity
Aging Utilities Infrastructure	✓	✓	✓

PHASE 3 reduces energy costs and frees up electrical capacity

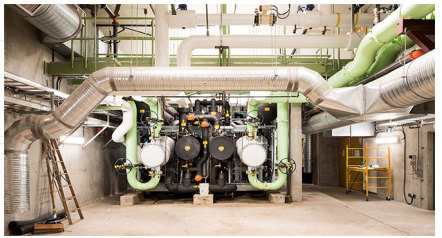
- Replace Inefficient Chillers
- Use Lake Water for Cooling
- Add Thermal Storage

ENERGY TRANSFORMATION STRATEGY

ENERGY SYSTEM ISSUES	ENERGY EFFICIENCY 1 *Expand metering, upgrade controls, data analytics and green revolving fund.*	CONVERT TO HOT WATER 2 *Convert from steam to hot water heating.*	CENTRAL COOLING 3 *Replace inefficient chillers, use lake water for cooling, and add thermal storage.*	ELECTRIFY HEATING 4 *Use heat pumps to extract heat from cooling towers, sewer and lake water.*
Greenhouse Gas Emissions	**15%** reduction in GHGs	**20%** reduction in GHGs	no additional reduction	**45%** reduction in GHGs
Energy Consumption	**30%** energy reduction	**20%** energy reduction	**10%** energy reduction	**15%** energy reduction
Electrical Capacity Constraint	**2%** more capacity	**2%** **less** capacity	**25%** more capacity	**30%** less capacity
Aging Utilities Infrastructure	✓	✓	✓	✓

PHASE 4 is about moving away from fossil fuels

- **Use Heat Pumps to extract heat from cooling towers, sewer and lake water**



ENERGY TRANSFORMATION STRATEGY

ENERGY SYSTEM ISSUES	1 ENERGY EFFICIENCY	2 CONVERT TO HOT WATER	3 CENTRAL COOLING	4 ELECTRIFY HEATING	5 FINAL PUSH (FULL DECARBONIZATION)
	Expand metering, upgrade controls, data analytics and green revolving fund.	*Convert from steam to hot water heating.*	*Replace inefficient chillers, use lake water for cooling, and add thermal storage.*	*Use heat pumps to extract heat from cooling towers, sewer and lake water.*	*Continuously evaluate emerging technologies for full decarbonization.*
Greenhouse Gas Emissions	**15%** reduction in GHGs	**20%** reduction in GHGs	no additional reduction	**45%** reduction in GHGs	**20%** reduction in GHGs
Energy Consumption	**30%** energy reduction	**20%** energy reduction	**10%** energy reduction	**15%** energy reduction	?
Electrical Capacity Constraint	**2%** more capacity	**2%** **less** capacity	**25%** more capacity	**30%** less capacity	?
Aging Utilities Infrastructure	✓	✓	✓	✓	?

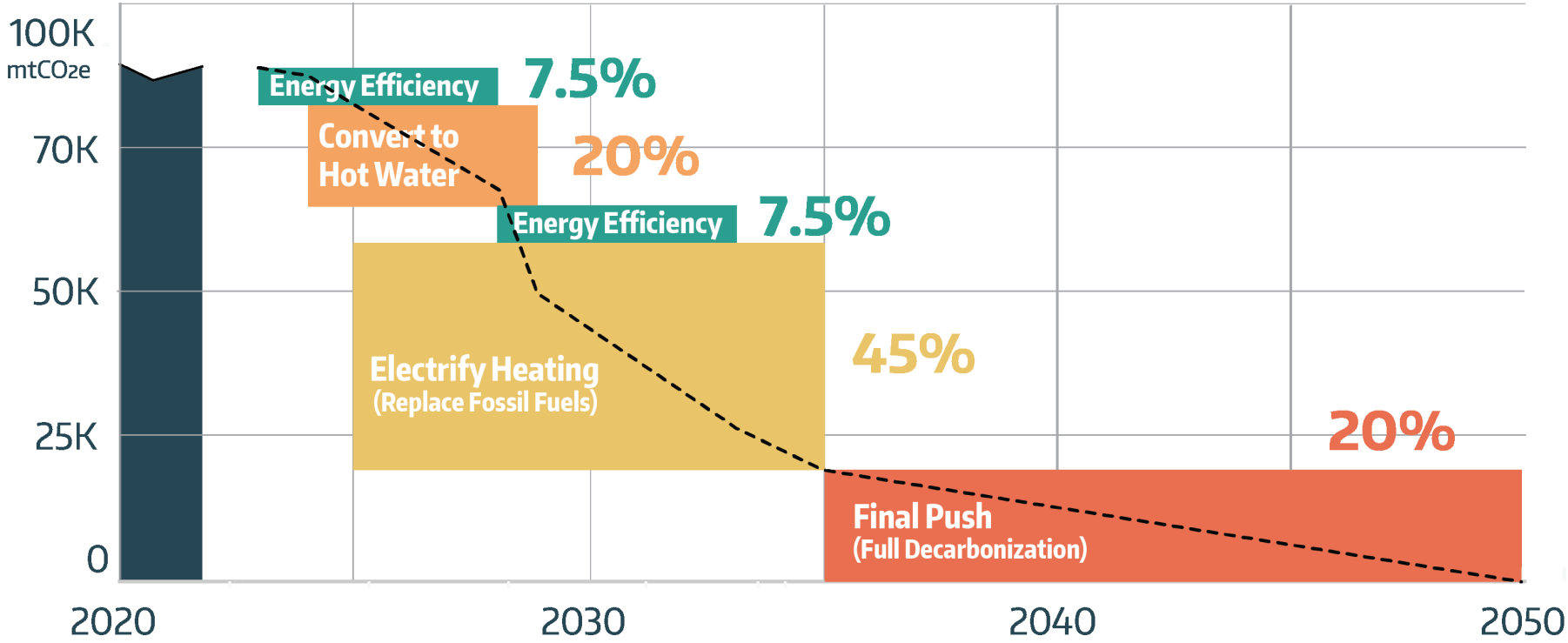
PHASE 5 will remove the remaining carbon from our energy system

ENERGY TRANSFORMATION STRATEGY

ENERGY SYSTEM ISSUES	1 ENERGY EFFICIENCY *Expand metering, upgrade controls, data analytics and green revolving fund.*	2 CONVERT TO HOT WATER *Convert from steam to hot water heating.*	3 CENTRAL COOLING *Replace inefficient chillers, use lake water for cooling, and add thermal storage.*	4 ELECTRIFY HEATING *Use heat pumps to extract heat from cooling towers, sewer and lake water.*	5 FINAL PUSH (FULL DECARBONIZATION) *Continuously evaluate emerging technologies for full decarbonization.*	GOAL 100% CLEAN ENERGY
Greenhouse Gas Emissions	**15%** reduction in GHGs	**20%** reduction in GHGs	no additional reduction	**45%** reduction in GHGs	**20%** reduction in GHGs	**100% reduction in GHGs**
Energy Consumption	**30%** energy reduction	**20%** energy reduction	**10%** energy reduction	**15%** energy reduction	?	**75% Reduction in Energy Use**
Electrical Capacity Constraint	**2%** more capacity	**2%** **less** capacity	**25%** more capacity	**30%** less capacity	?	**Accommodate Capacity Constraint**
Aging Utilities Infrastructure	✓	✓	✓	✓	?	**Resilient Infrastructure**

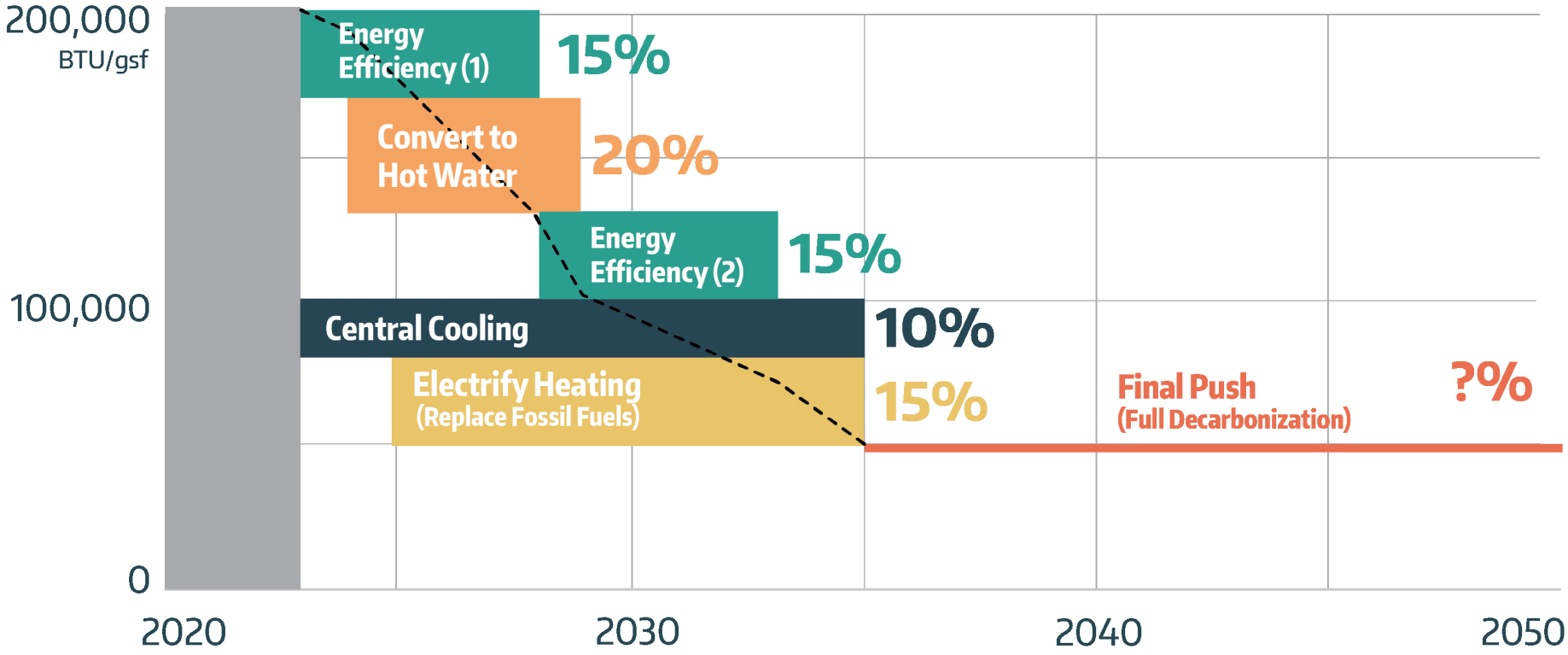
TRANSFORMATION STRATEGY OVER TIME:

FOCUS ON GHG EMISSIONS



TRANSFORMATION STRATEGY: OVER TIME

FOCUS ON ENERGY EFFICIENCY



TRANSFORMATION STRATEGY:
COST

	1 ENERGY EFFICIENCY	2 CONVERT TO HOT WATER	3 CENTRAL COOLING	4 ELECTRIFY HEATING	5 FINAL PUSH (FULL DECARBONIZATION)
	Expand metering, upgrade controls, data analytics and green revolving fund.	*Convert from steam to hot water heating.*	*Replace inefficient chillers, use lake water for cooling, and add thermal storage.*	*Use heat pumps to extract heat from cooling towers, sewer and lake water.*	*Continuously evaluate emerging technologies for full decarbonization.*
Cost (rough order of magnitude)	**$18M** for metering and controls, money spent on efficiency is recouped through utility savings	**~$250M** this reflects the cost of routing new pipes and updating the heat exchangers at buildings	**~$100M** this reflects the cost of new chillers and decomissioning aging chillers	**~$100M** for heat pumps and piping to extract lake cooling **~$100M** for thermal storage	**?** this will depend upon emerging technologies
Source	**UW Facilities**	**a combination of state support, grants, indirect tax incentives, utility payments to a 3rd party and green bond debt funding**			


HERE'S WHAT WE NEED

WHAT WE NEED

- UW wide initiative and commitment (led by UWF)
- Engaged partners and stakeholders
- Financing strategy support

NEXT STEPS

CURRENT AND NEXT STEPS

We have begun to escalate investment in efficiency

We are purchasing new meters and building controls and are seeking funds for data analytics

We are working on a contract for an engineering firm to refine the technical and financial elements of the energy strategy.

We are developing an initial hot water conversion project (WCUP loop)

Thank you for your interest and support

Send questions to:
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UNIVERSITY of WASHINGTON