

BROWN UNIVERSITY THERMAL EFFICIENCY PLAN



Integrated project



Sound business plan

\$1M energy savings per year



Strategic

Important energy, water, and O&M savings



High Priority

Accelerate capital renewal plan



Positive impact on activities

Non-disruptive for students, operational reliability, & safety

TEP GOALS

- ✓ Significant contribution to Brown University's greenhouse gas emissions reduction goal of 42% below the 2007 baseline level of 73,000 metric tons CO₂ by 2020 through the implementation of Energy Conservation Measures (ECMs) on existing assets.
- ✓ Accelerated Asset Renewal: \$24M project of which \$16.9M is asset renewal
- ✓ Move from steam to medium temperature water, decreasing risk.
- ✓ Decrease utilities, operating, and maintenance expenses.
- ✓ Reduce or eliminate the use of #6 oil.
- ✓ Helps move preventive maintenance toward 80% planned and 20% reactive.

Heating Distribution Network Generation



1st GEN
Steam

19th century



2nd GEN
HTHW



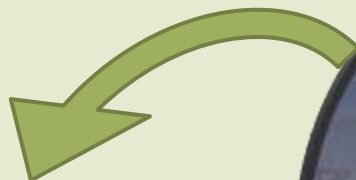
Early
20th century



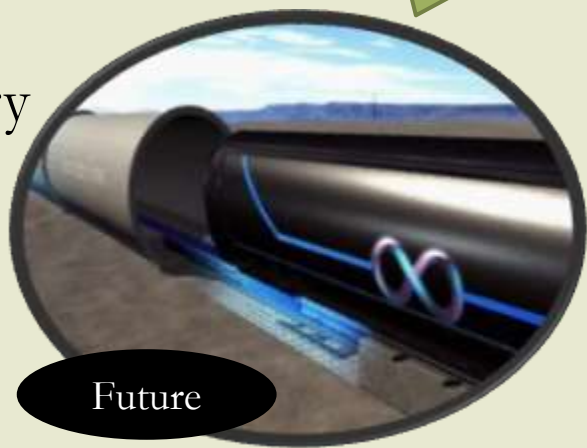
3rd GEN
MTHW



NOW

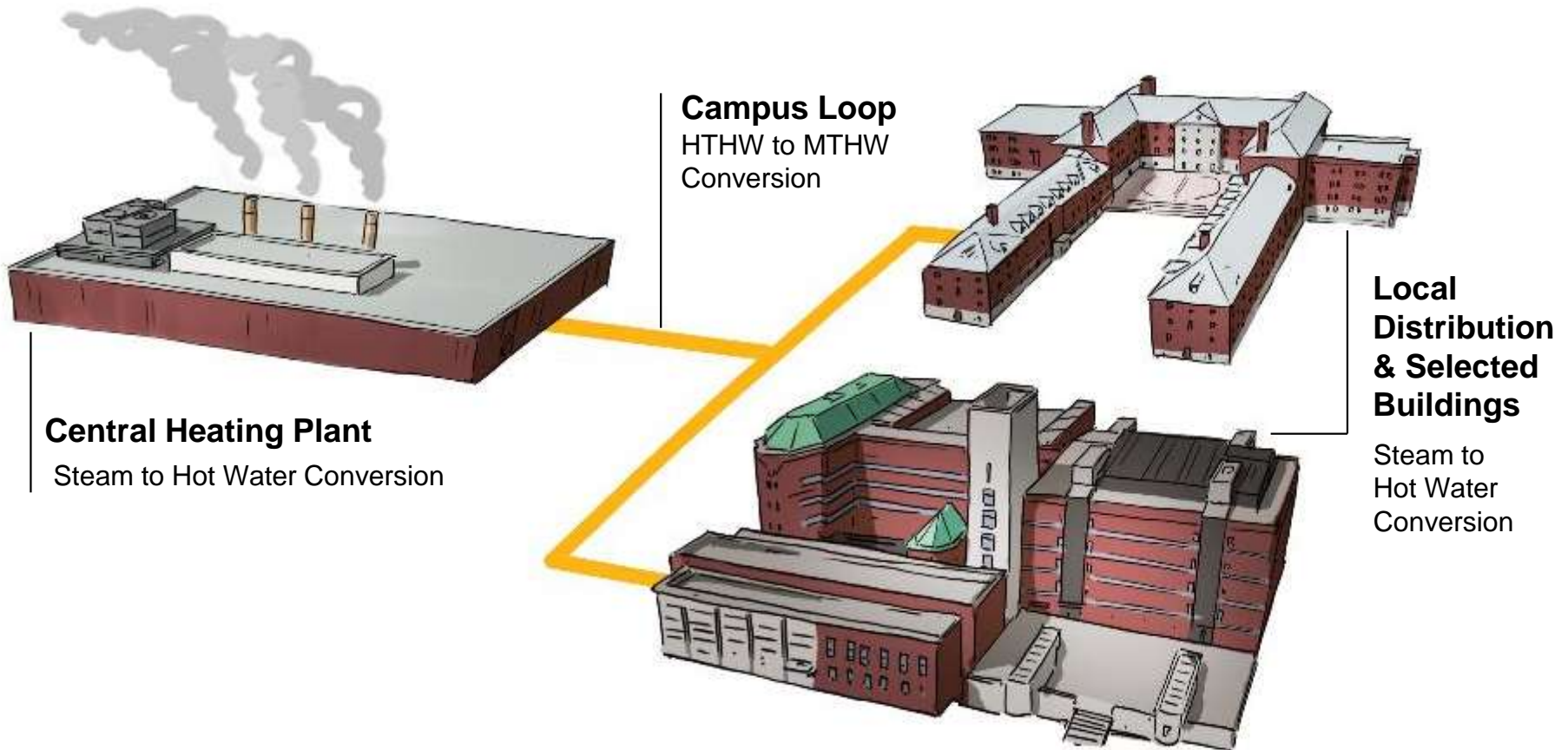


4th GEN
Heat Recovery
& Capture



Future

PROJECT AT A GLANCE



FUTURE PATH

- Enabling project for future energy systems/techs:
 - Heat recovery/ hot and chilled water Storage
 - Low temperature heating network/heat pump as primary and secondary mover
 - Leverage asset renewal into a **transformational approach for the campus of the future: strategic electrification to eliminate fossil fuel combustion:**
 - **Heat Pumps: Water Source/Air Source/ Geothermal**