Campus Statistics

228 Buildings -93 connected to the district heating network

District high temperature/high pressure hot water loop

\$18 M annual energy spend

33 district heating hubs

22 hot water hubs

11 steam hubs, 6 of which were already budgeted for conversion

Project Drivers

Reduce GHG emissions 42% below 2007 levels by 2020

Address steam hub deferred maintenance requirements

Increase district heating network efficiency

District Heating Loop -**Supply Temperature**

Current: 330°F Future: 250°F

Re-engineering the

District Heating Loop

Lower temperature hubs connected

in series to maximize the ΔT , reduce

flow, enabling reuse of existing

district network at lower

temperatures.

Optimizing **Hot Water Hubs**

Increase the ΔT to optimize the district heating network efficiency

Operational Outcomes

Asset renewal budget for steam hubs Simplified maintenance with 40% fewer steam traps, fewer converters

Improved reliability for research buildings, which were struggling to get the right steam pressure during shoulder season

Financial

Outcomes

8.5% IRR

\$1M/yr guaranteed energy savings

\$1M one-time incentives

\$16.8M in asset renewal successfully

leveraged for transformational change

to the entire loop.

\$25M total investment

Energy and Environmental Outcomes

4,700 MTCDE/yr GHG emissions reduction 91,000 MMBTU/yr natural sas savings

7.5M gallons/yr water savings

Central Heating Plant

240,000 lbs/hr total steam capacity 3 existing steam boilers modified to high temperature hot water

District Heating Loop -Return Temperature

Current: 275°F Future: 200°F

Steam Hub Conversions

hot water or decoupled from district network (mostly for process steam loads)

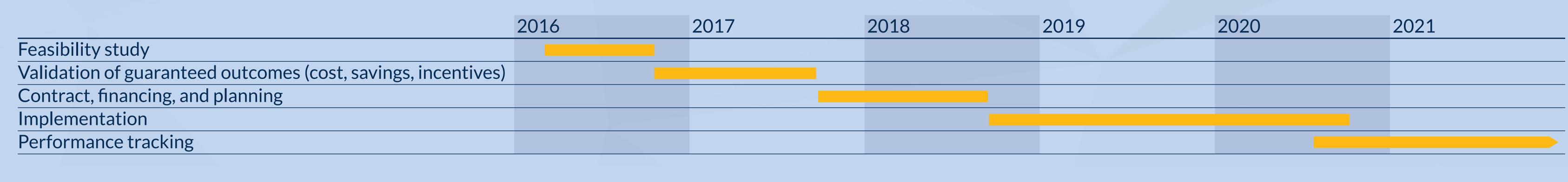
All steam hubs converted to

Brown University – Thermal Efficiency Project

A holistic approach to GHG emissions, operating costs & aging infrastructure

Full project synopsis featured in the latest issue of District Energy Magazine

Integrated Project Delivery Schedule



Adifferent approach to achieve ambitious targets

- 1. Holistic deep energy retrofit unlocked more value than onefor-one piecemeal replacement approach could.
- 2. An integrated project delivery method with early engagement and close, continuous collaboration with the Facilities Management, Sustainability, Financing and other stakeholders breaks down the silos and promotes effective project planning with minimum disruption.
- 3. Outcome-based approach guaranteed costs savings, incentives, project schedule - better align interests and delivers the greatest long term value for Brown.



