

Energy and MEP Design Guidance | February 2020

This document is to establish design guidelines for heating systems on future CSU, Chico buildings and provide clarification on the vision provided by the Master Plan. In order to meet 2030 carbon neutrality goal, buildings will need to work together with campus utilities to reduce emissions gradually and maintain operational flexibility to reduce operating costs. Operational flexibility refers to the operating engineer's ability to dispatch loads to minimize demand charges, as well as utilize electrical heating equipment when demand is low to reduce natural gas consumption. This document outlines strategies based on budget, space availability, and electrical capacity at the buildings.

Minimum Requirements:

Natural Gas Appliance (NGAs) – No new construction, renovation, or project shall have NGAs including boilers or domestic hot water heaters. Any exceptions shall be presented with electrical alternatives to the AVP of Facilities and Capital Projects to understand the cost impact.

Hybridized Central Plant Steam – All buildings utilizing campus 12kV will utilize central plant steam for primary heating during winter months (December-February). Any local electrical heating devices shall be designed at a minimum to meet the heating requirements at 40 degrees ambient.

Future HHW Loop – Heating systems will be designed to accept 130 F hot water in the future when the steam system is abandoned and replaced with a HHW loop.

Electrical capacity– Building transformers that are being replaced must have the capacity for future electrical heating using a combination of resistive and heat pump technologies.

Space for future electrical heating equipment – In the event that project budget cannot support a local electrical heating device, the mechanical spaces for such a device and stub outs shall be included as much as practical.

No project shall violate the minimum requirements and prevent future projects from eliminating scope 1 emissions from the building.

Ideal Requirements:

Electrical Heating Equipment – Projects are encouraged to include electrical heating devices to move or generate heat from various sources. This equipment includes but is not limited to:

- Air Source Heat Pump, VRF, Heat Recovery Chillers
- Water Source Heat Pump – May extract heat from the CHW loop at 60 F during the shoulder seasons
- Electric Boiler

Supporting Clusters – Ideally heating equipment will be oversized to contribute to the HHW loop and/or CHW loop. This may include the neighboring buildings or interface with the campus CHW thermal energy storage.



Hot Water Storage – Hot water storage is encouraged locally at the building and if possible, inside the building envelop. The hot water storage can be used with the electrical heating device to reduce demand and increase the thermal mass of the building.

Energy Storage – Batteries shall be used for peak shaving, load shifting, supporting micro grids and short term emergency power. Diesel generators are acceptable as a secondary source. Sufficient local energy storage can eliminate the requirement for a connection to the central steam utilities. This is accomplished by sizing the system with the main grid and no net increase in demand.

Long Term Goal For all buildings:

Solar, energy storage and electrical heating capacity to serve buildings without central plant utilities.

Building “clusters” are served by nearby equipment including heating equipment. FMS is working on a map to define clusters.

Steam infrastructure abandoned – During the transition period, the oldest building will remain on steam, and steam may be used as a backup heating system to avoid demand charges. The final configuration will be a HHW loop with no steam support. All projects should support this long term vision for the campus.