Stanford
ENERGY SYSTEM
INNOVATIONS

For more information about SESI visit:
sustainable.stanford.edu/sesi

or contact

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OVERVIEW

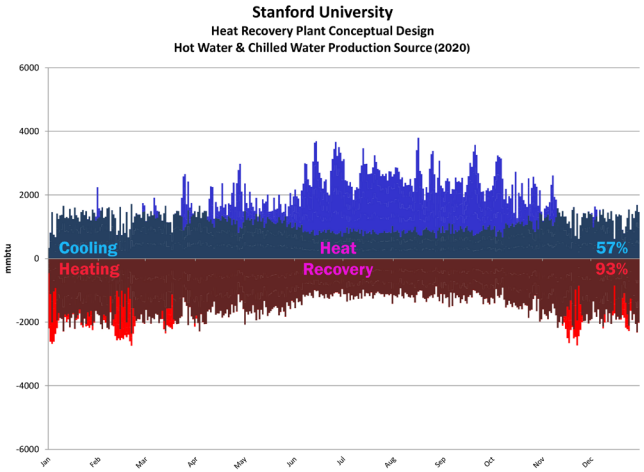
The Stanford Energy System Innovations (SESI) project includes high efficiency standards for new buildings; continued efficiency improvements for existing buildings; and the cutting-edge energy supply system known as the SESI project.

Highlights

» Electrification of the campus energy system
» Conversion from steam to hot water
» Reduction of campus greenhouse gas (GHG) emissions by 68%
» Decrease in water use by 15%
» Capital cost of $485 million will save $420 million over 35 years
» Project timeline of five years, from planning to completion

Innovations

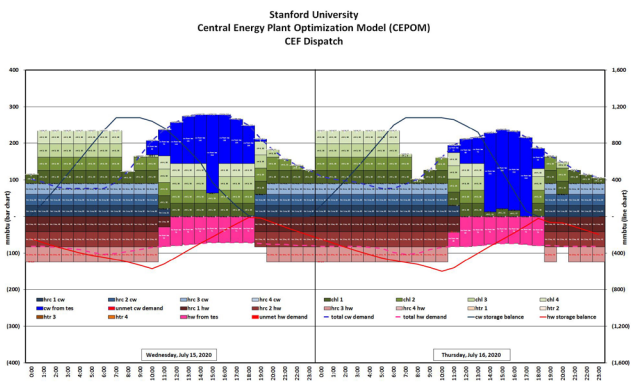
» A patented plant operating system
» Heat recovery
  - 57% waste heat from cooling is recovered
  - Meets 93% of campus heat load
» Both hot water and cold water thermal energy storage



PROJECT FEATURES

Model Predictive Control

- Utilizes a 10-day forward looking hourly plan
- Provides continuous 15 minute updates
- Downloads weather forecast
- Predicts energy load and price
- Interrogates plant conditions
- Develops an optimum hourly dispatch plan
- Features advisory or autonomous operations
- Provides annual and multi-year planning and design tools



New High-Voltage Substation

- 60kv of electricity is transformed to 12kv
- Five transformers provide 20mva each, for a total capacity of 100mva
- Flexible switching
- Redundant transmission feeds
- Ten new tie-ins to existing 12kv campus grid

Hot Water Distribution System

Installed in two years, the hot water distribution system requires less maintenance than steam, and is safer. The steam system was retained during installation, and then abandoned in place after transition to the new hot water system.

- 22 miles of underground piping
- Proven European district hot water design
- Shallow depth, direct-bury welded steel
- Pre-insulated, integrated leak detection
- Chemical-free hot water chemistry
- Five temporary district heat exchangers used during the transition

Building Conversions

- 155 locations
- Replaced steam heat exchangers with hot water
- Pre-constructed skids for faster installation
- Used winter test programs for proof of concept

Hot and Cold Thermal Energy Storage

- Lower capital and operations and maintenance cost
- Proxy for 10mw electricity storage
- Two 5-million-gallon cold water tanks
  - 90,000 ton-hour capacity
- One 2-million-gallon hot water tank
  - 600mmbtu capacity
- 20% per hour recharge/discharge rate
- Fully insulated welded steel