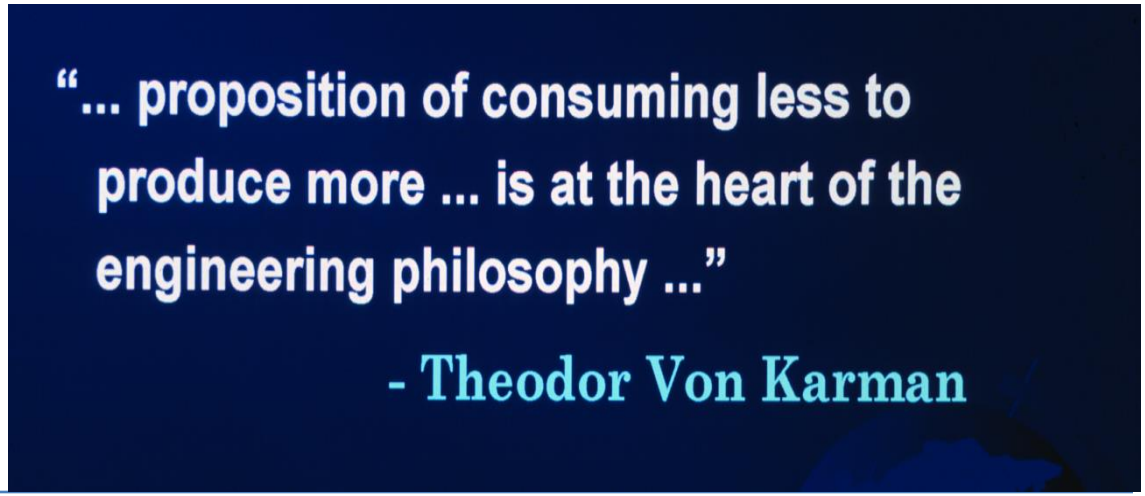
UNIVERSITY OF WYOMING LONG RANGE UTILITY PLANNING IN AN EVOLVING ENERGY MARKET

- University of Wyoming Campus Overview
- Master Planning Campus Utilities; aging, growth, efficiency and energy markets
- Consideration of Alternatives; technical, financial, environmental
- Summary



CAMPUS ENERGY UTILITIES

CEP Circa 1982

CEP production fleet inventory:

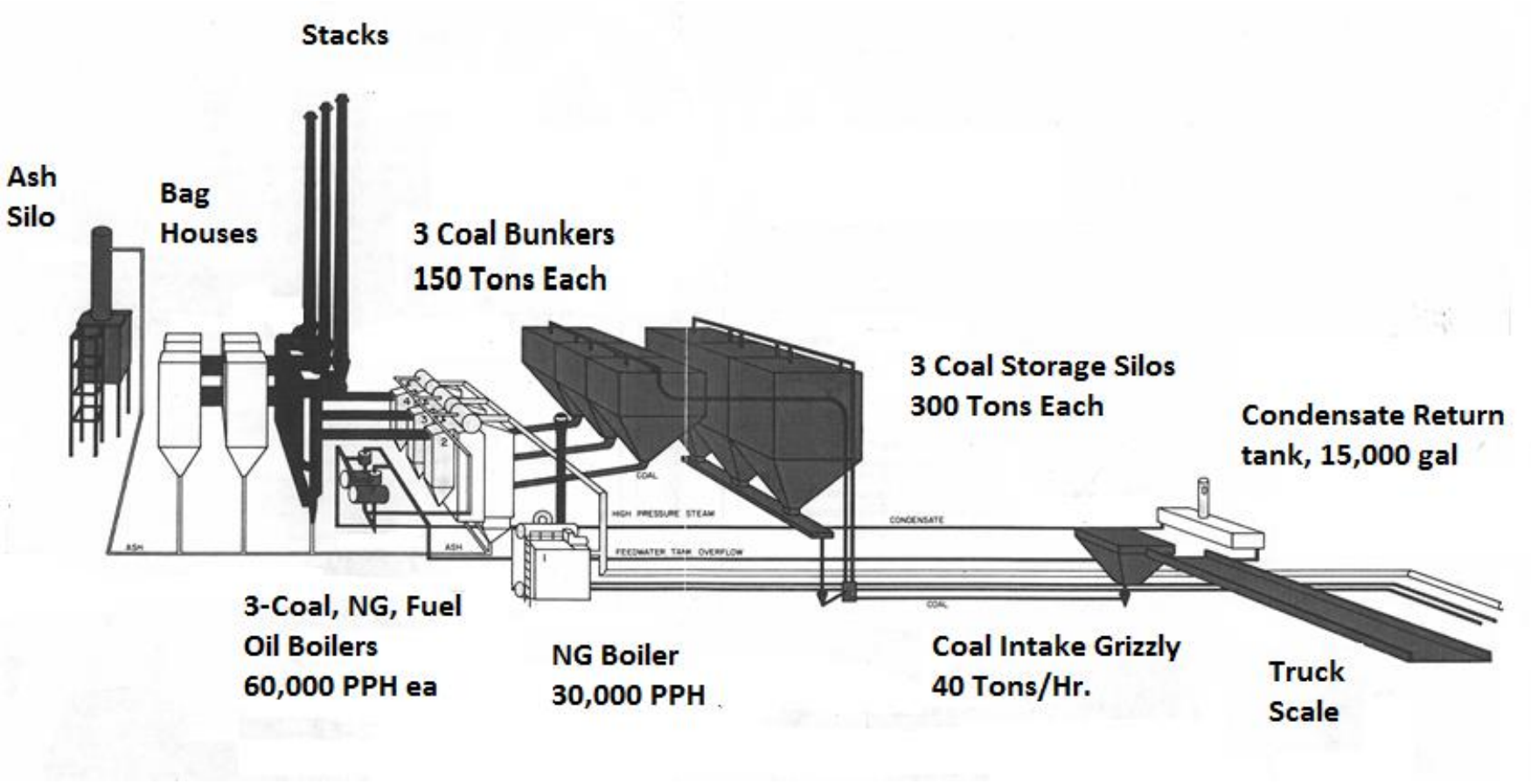
3 - 60,000 PPH IBW boilers, 125 psig discharge, NG, Coal or Fuel Oil

1 - 30,000 PPH, 125 psig Keeler boiler, NG & Fuel Oil

1 - 800 Ton Dual Centrifugal Compressor McQuay Chiller

1 - 1200 Ton York Centrifugal Compressor

CEP's COAL SYSTEM

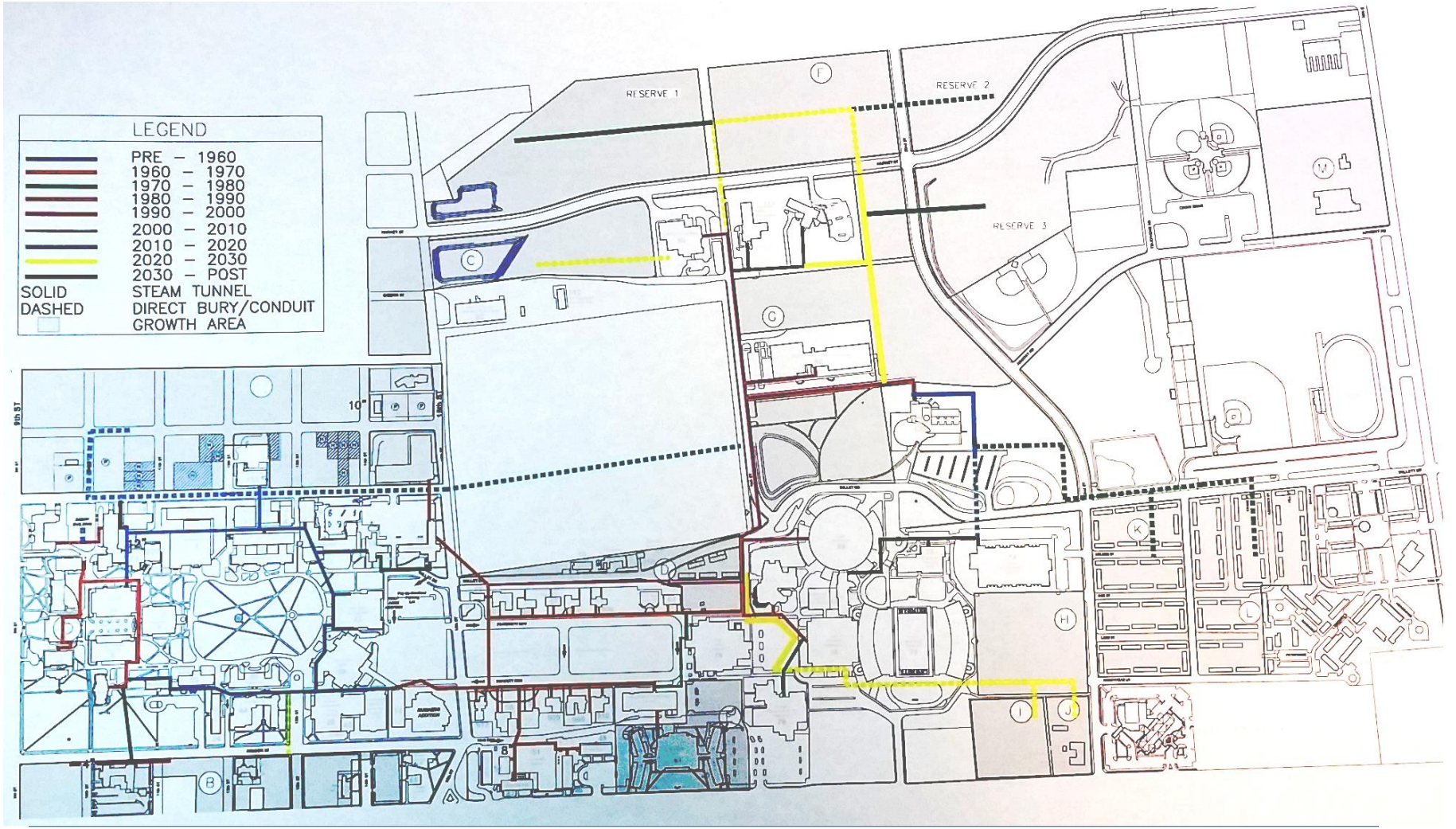


EXISTING INFRASTRUCTURE-KEEPING IT RUNNING

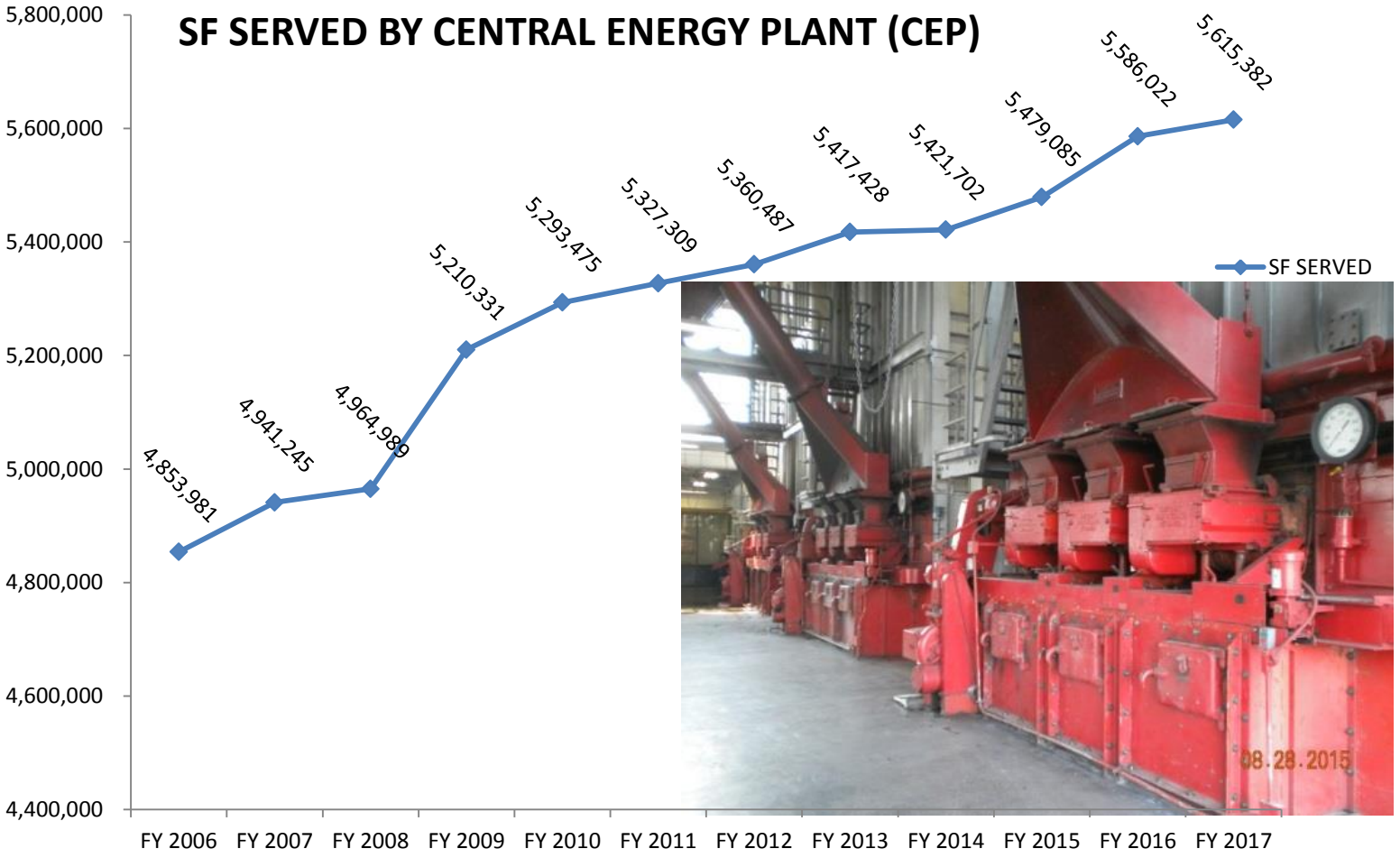
EXISTING INFRASTRUCTURE – KEEPING IT RUNNING

EXISTING INFRASTRUCTURE KEEPING IT RUNNING

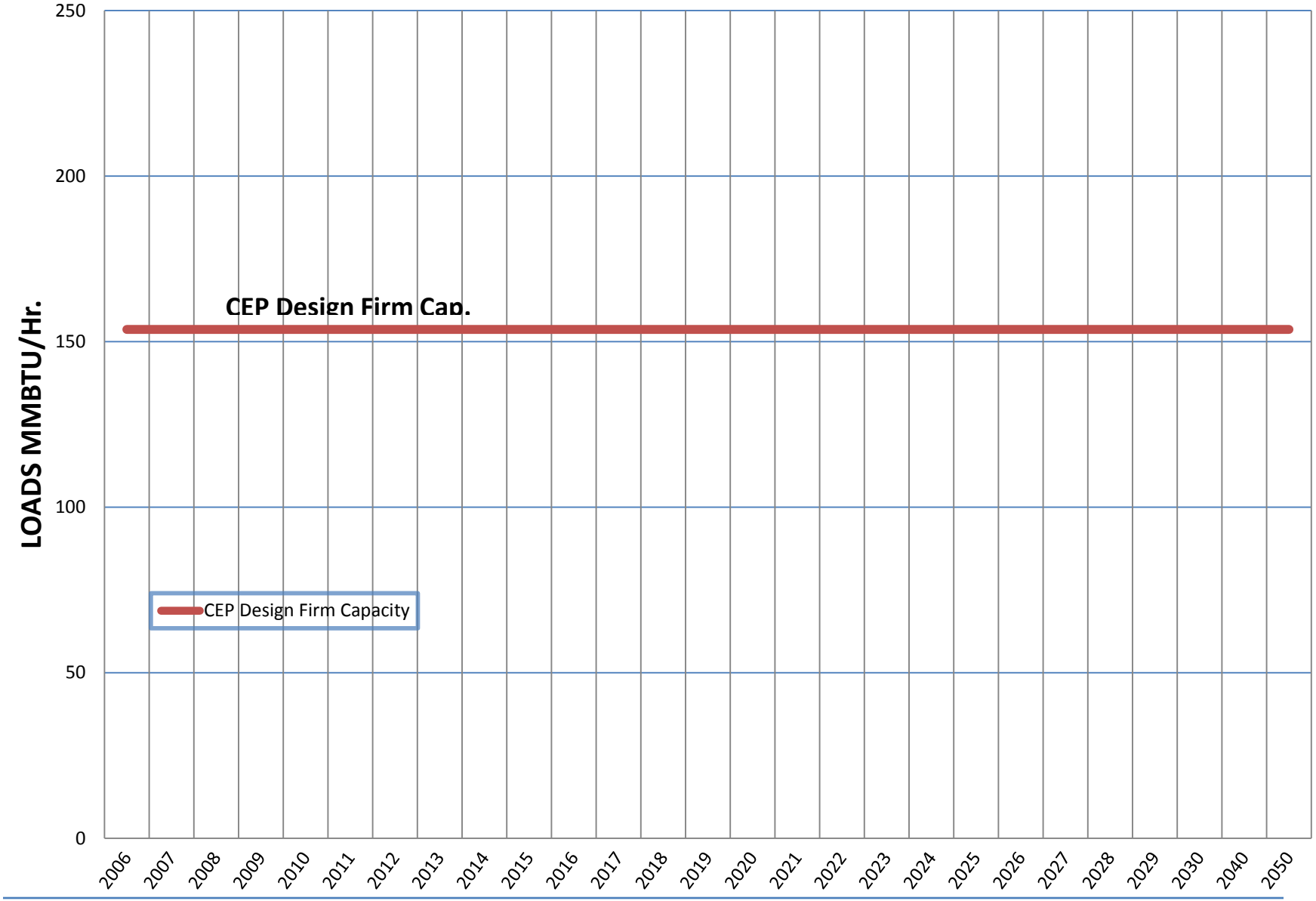
CAMPUS STEAM SYSTEM GROWTH



CAMPUS GROWTH



CAPACITY SCENARIOS FOR CORE CAMPUS



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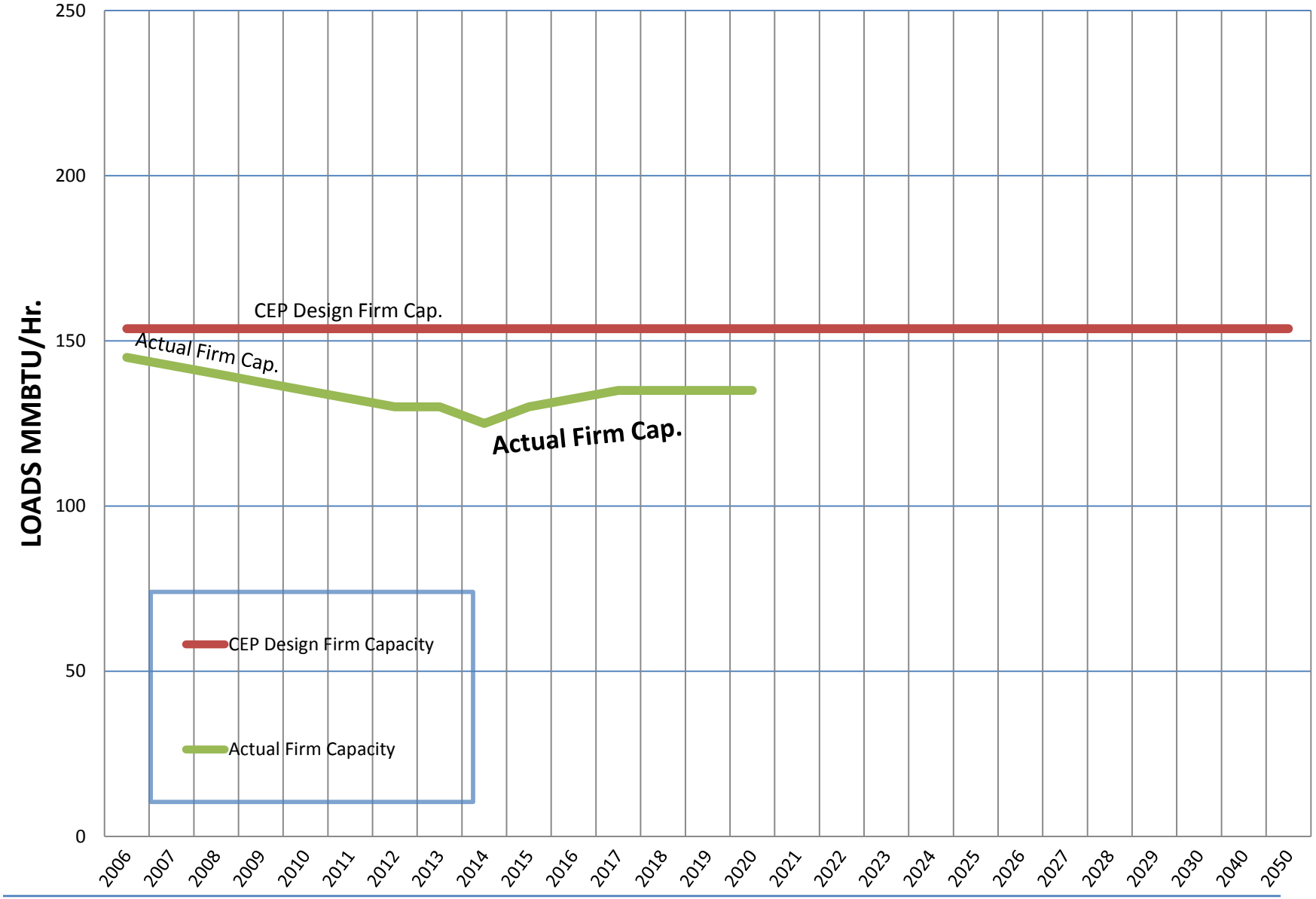

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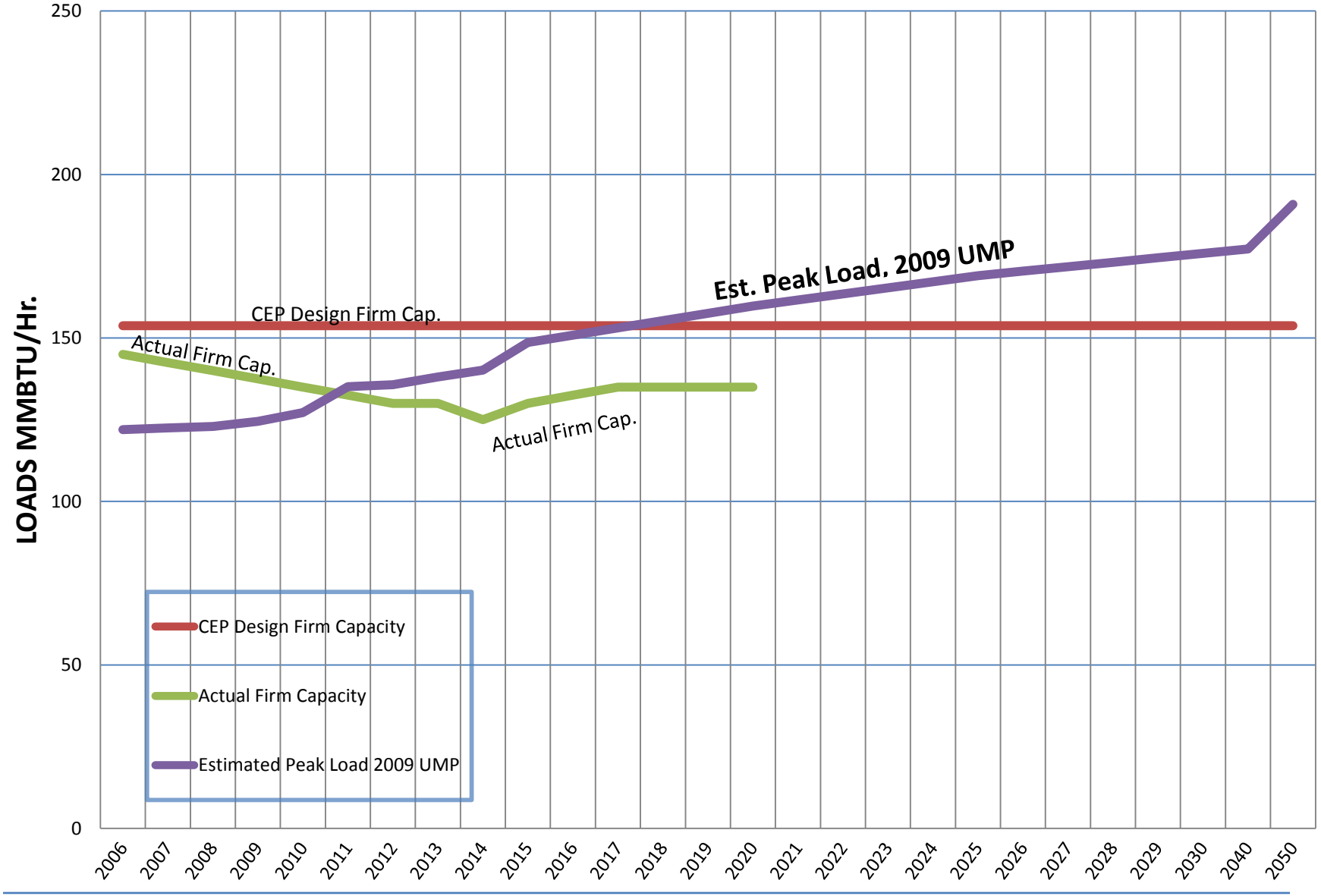

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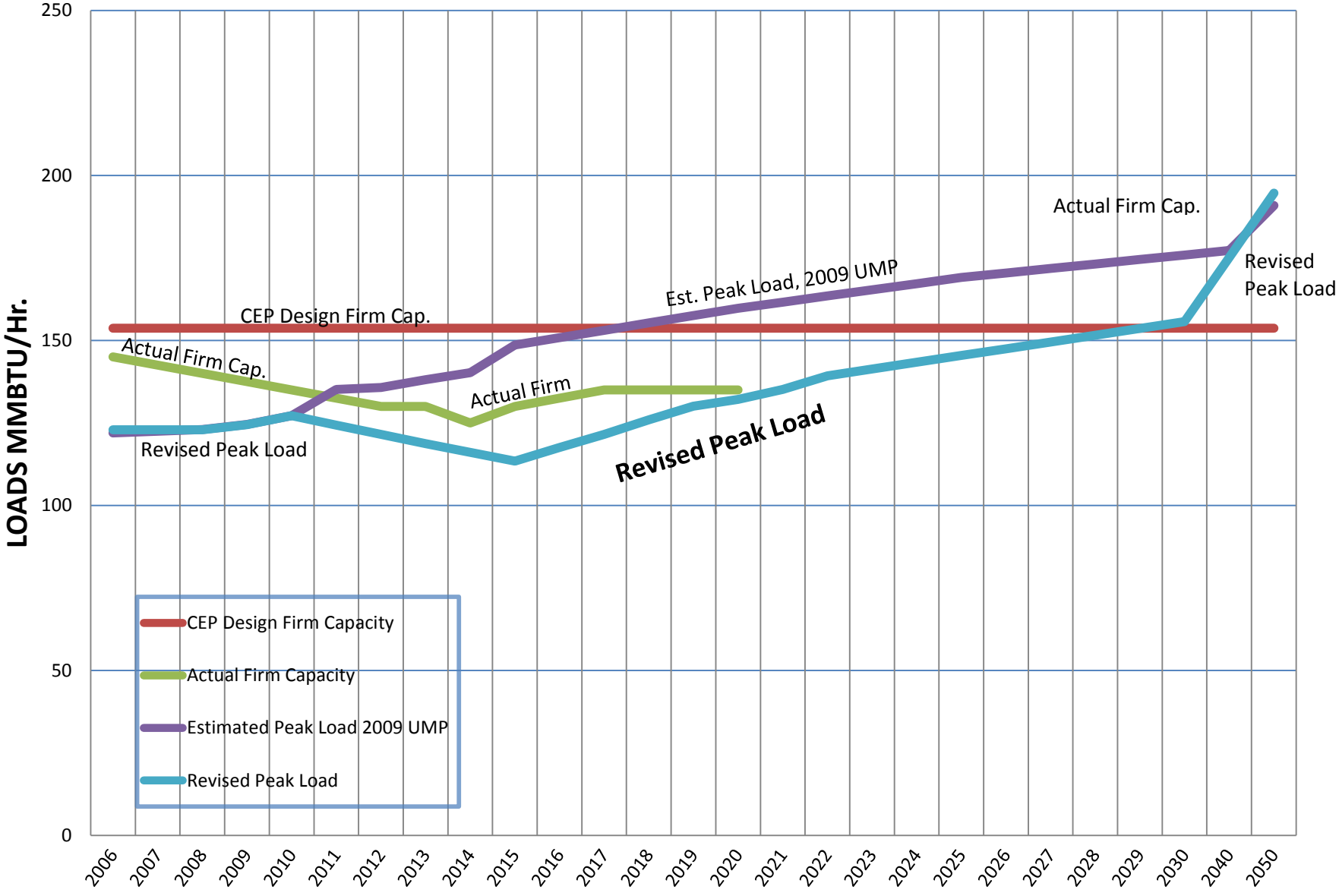

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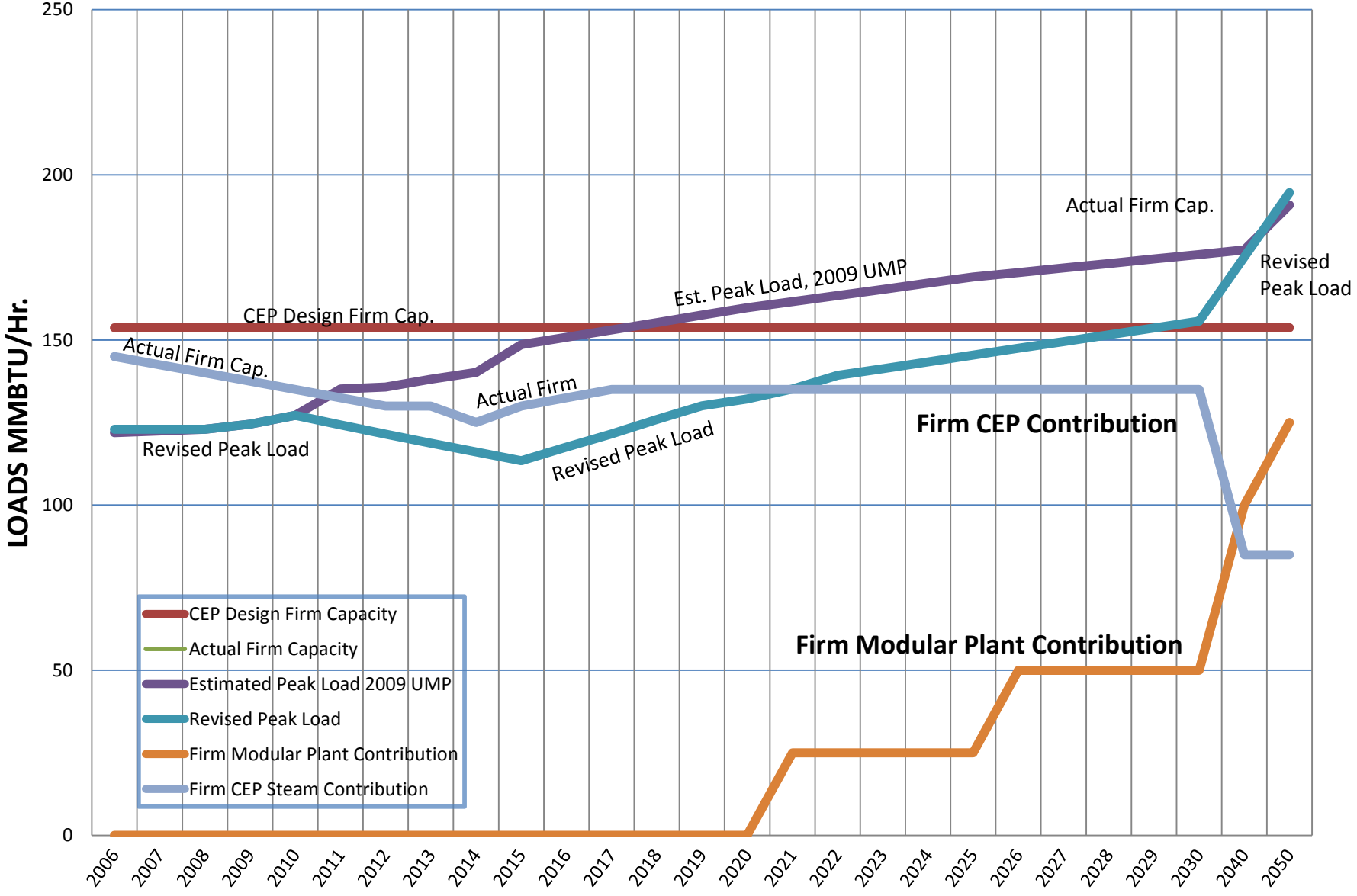
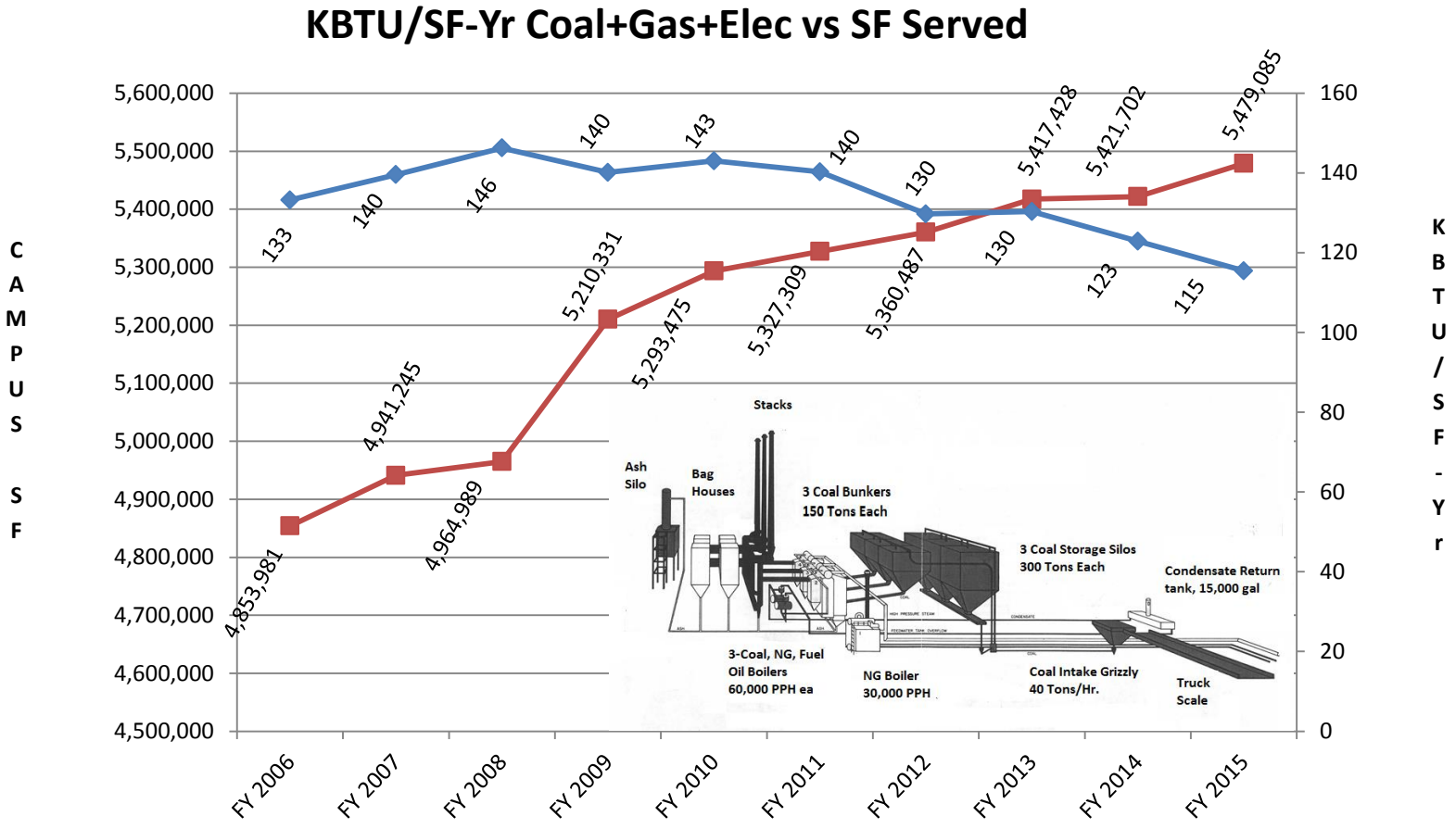
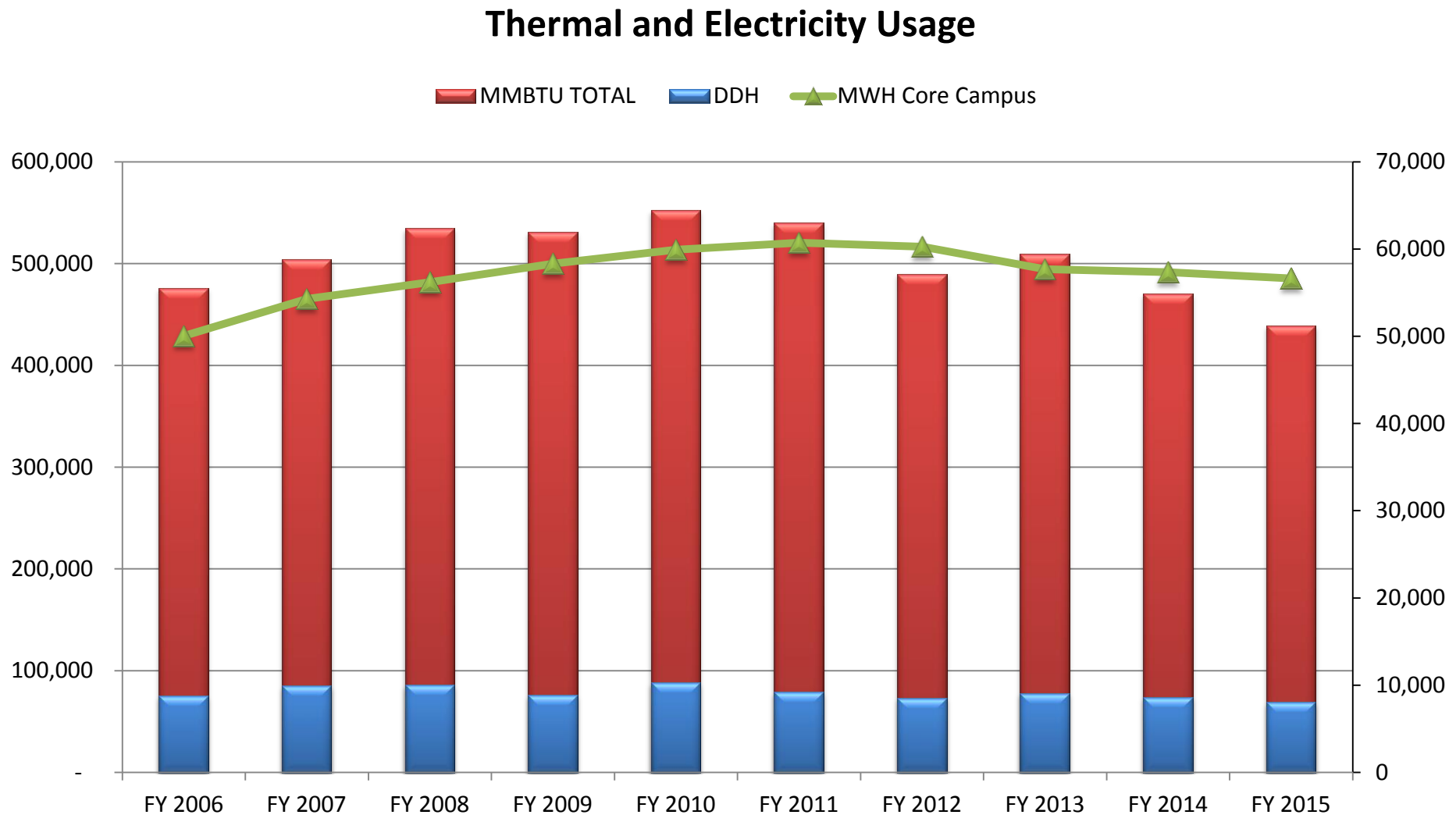


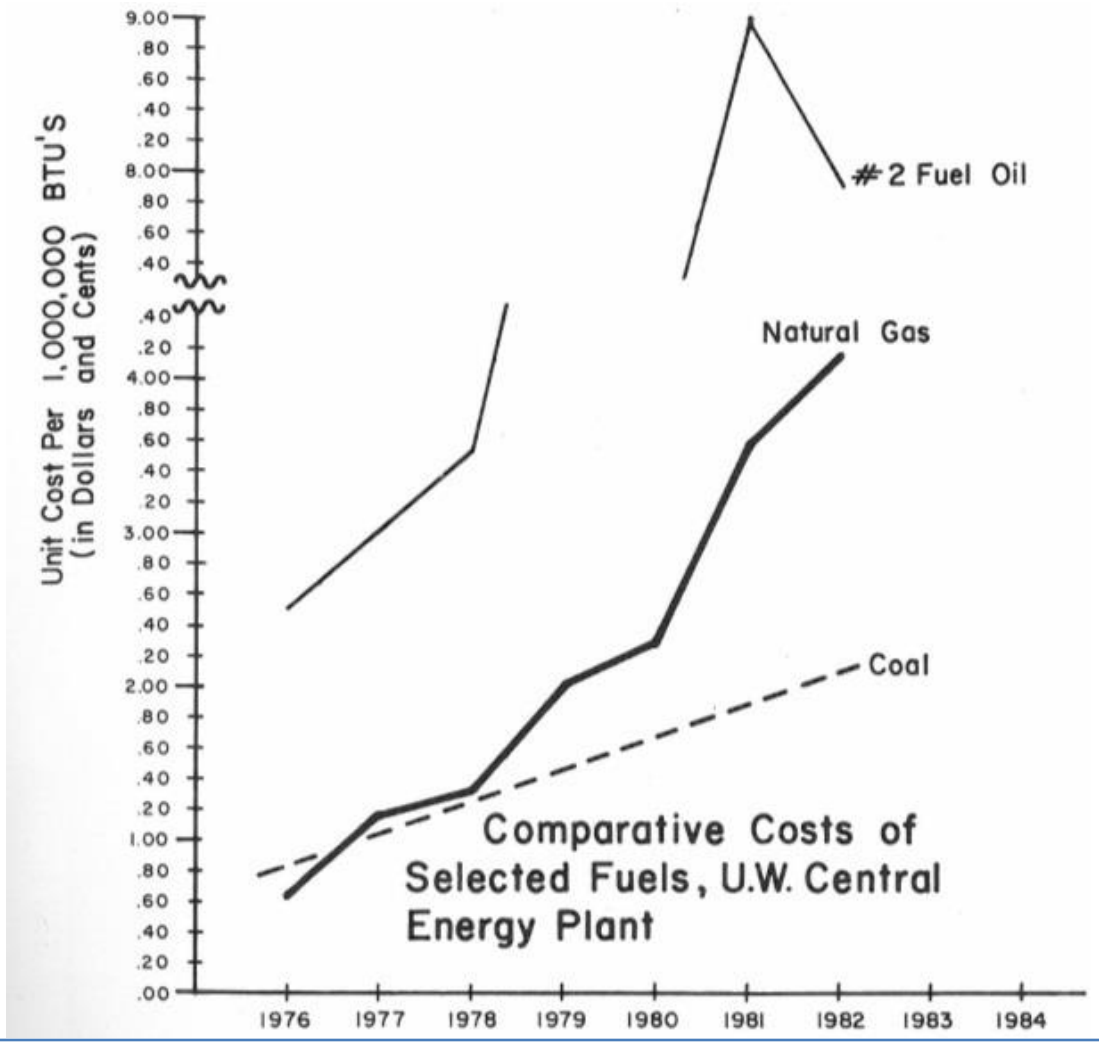
CAMPUS EFFICIENCY



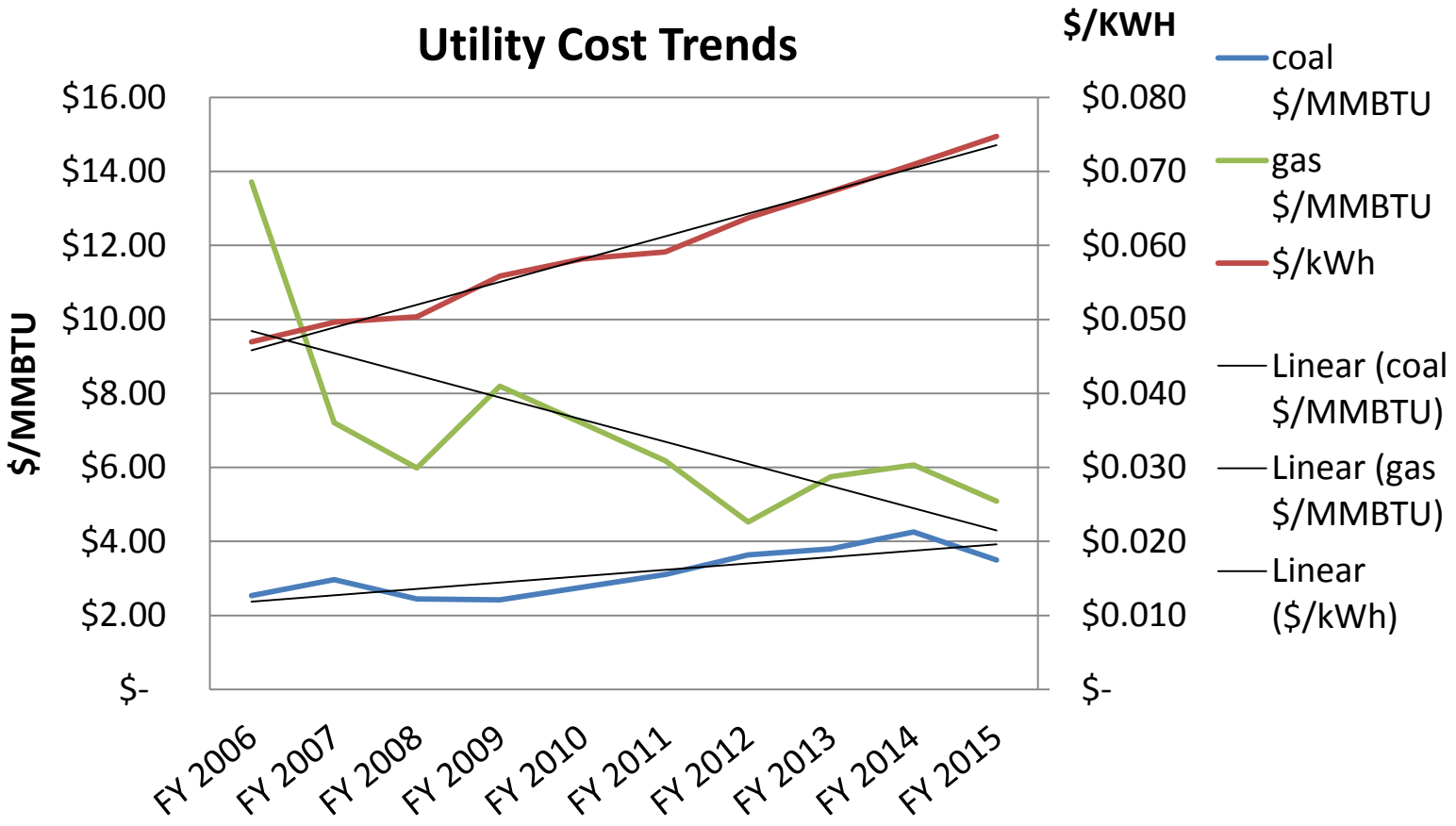
ENERGY USAGE



ENERGY MARKETS - Then



ENERGY MARKETS - Now



COAL RESOURCES THEN

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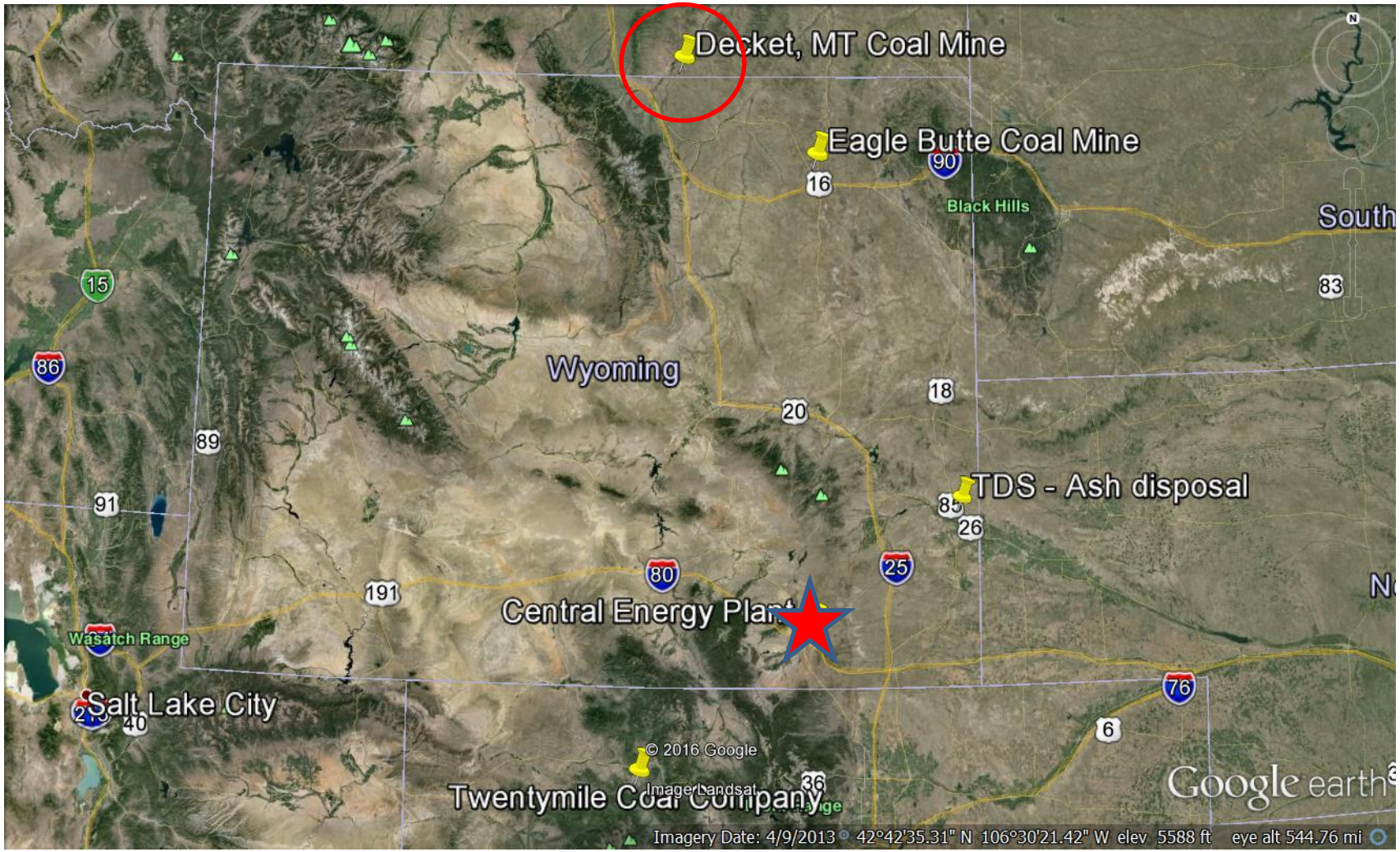


UWYO FINANCIAL ENVIRONMENT

- State of Wyoming Energy Economy
- State of Wyoming Economic Outlook
- University of Wyoming Funding and Alternatives

WHAT TO DO ? NOTHING DIFFERENT

- Operation and Maintenance: Production, Distribution , Terminal Use
- Environmental Considerations
- Efficiency: fuel –to-heat efficiency and improvement opportunity/cost
- Labor: Lack of skilled expertise to operate coal plant at this scale

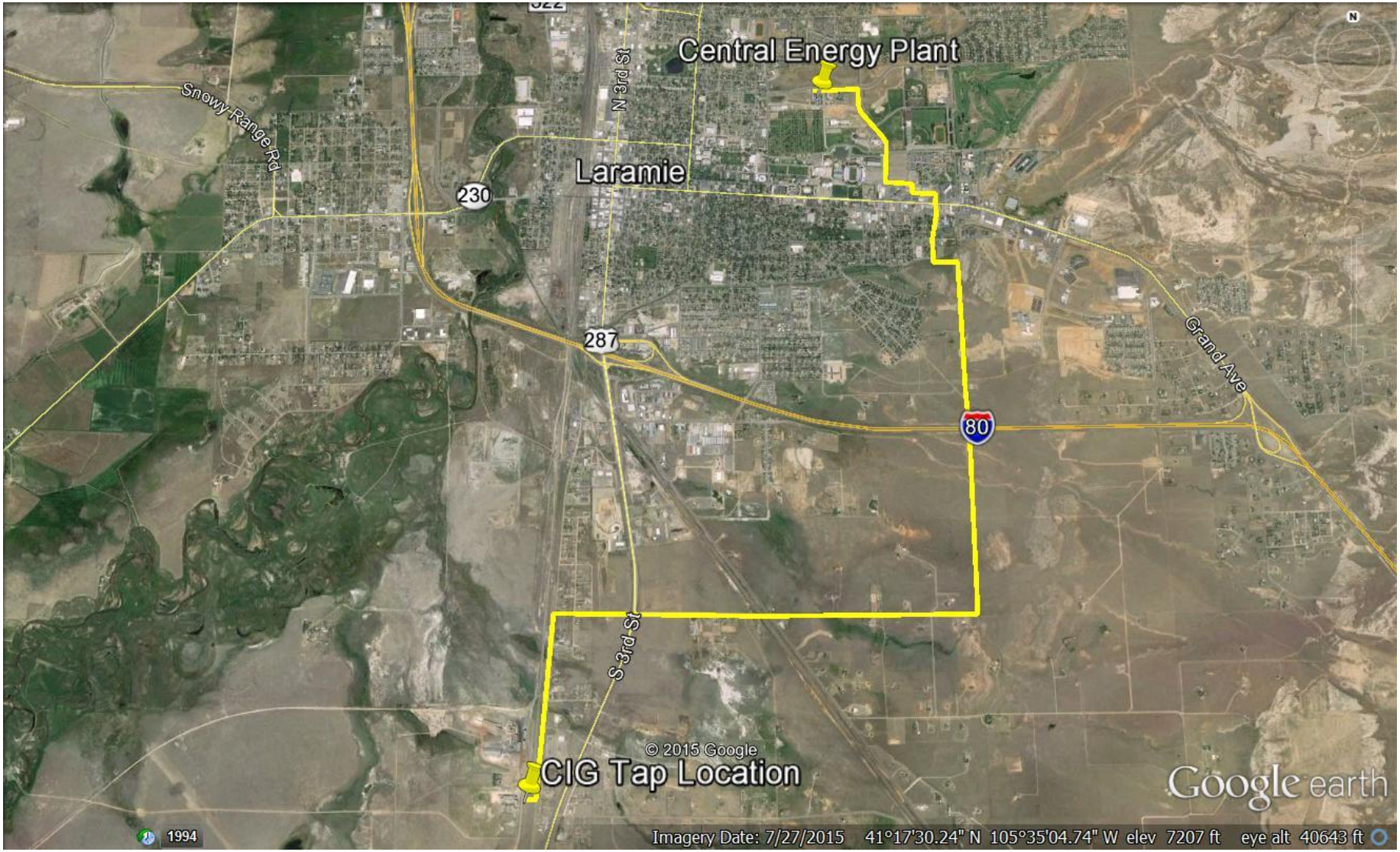
WHAT TO DO? INCREASE CAPACITY AT CEP

- New Biomass Unit
  - Fuel Availability
  - Material handling
- Improve Steam Distribution
- Emissions
- Operating alternatives - summer shutdown

WHAT TO DO - CAPACITY INCREASE WITH A MODULAR NATURAL GAS PLANT

- Extend Private Natural Gas to strategic locations on campus
- Construct heating water distribution loops in tunnels or buried
- Construct modular natural gas fired heating water plants with steam converter
- Reconnect to existing building heating water systems
- Phase out steam service over time (worst tunnels first)
- Phase in higher dT heating water coils

NATURAL GAS EXTENSION



SUMMARIZING

Improve campus efficiency to defer investment decision

Implement modular hot water plant concept to accommodate growth

Master plan to enable phased implementation and utilize existing infrastructure

Prepare campus to adapt to evolving energy markets