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CALIFORNIA'S POLICY GOALS & SMART GRID

IEPR Workshop – 5/14/09

Michael DeAngelis

SMUD

SUMMARY



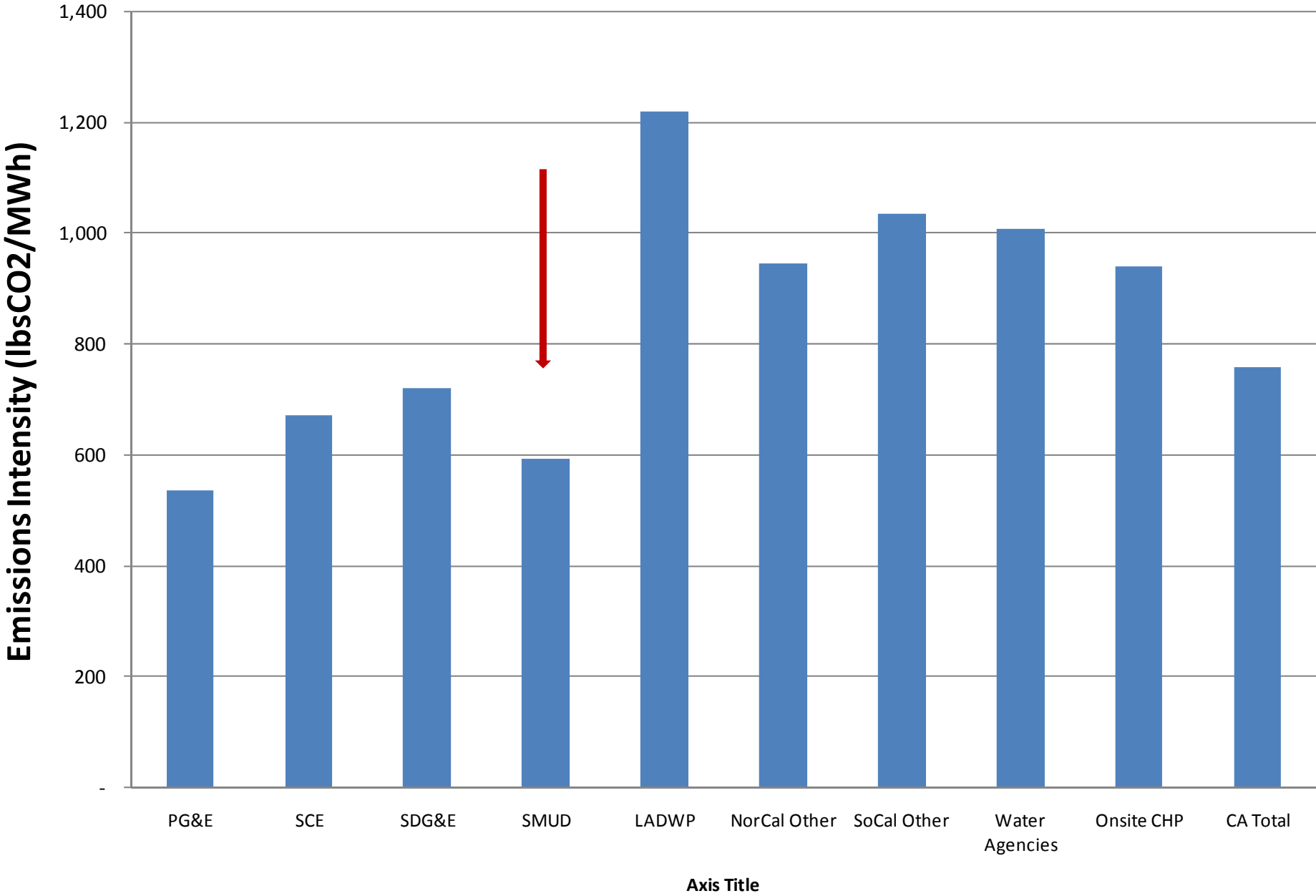
- SMUD Sustainable Power Definition
- Sustainable Power Challenges
- Renewable Energy Supply Goals/Status
- Distributed Generation & Distributed Storage
- Smart Grid Functionality

SMUD BOARD DEFINITION

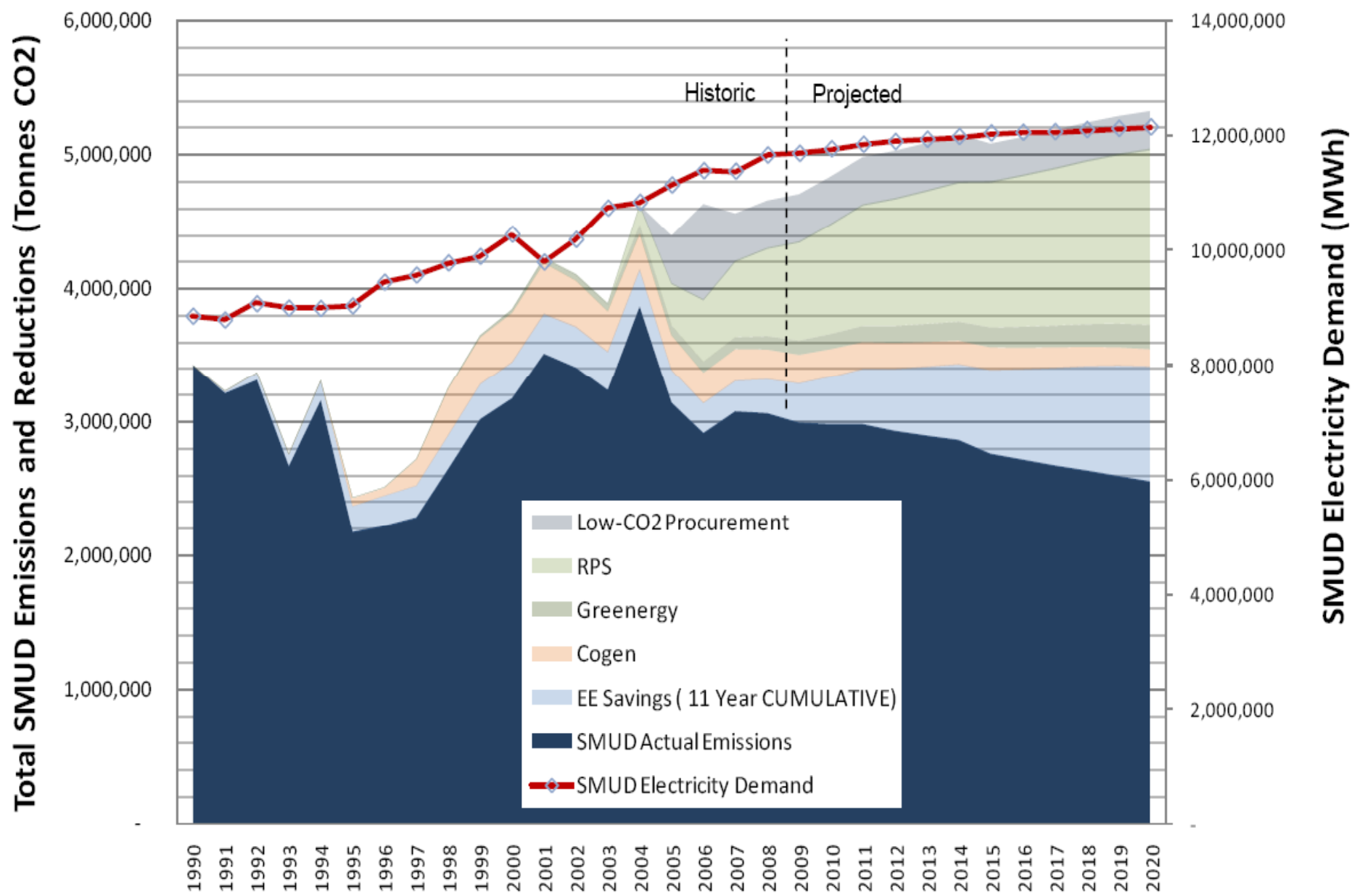


- Sustainable Power Supply reduces SMUD's long-term *greenhouse gas emissions from generation of electricity to 10% of its 1990 carbon dioxide emission levels by 2050* (i.e. <350,000 metric tonnes/year), while *assuring reliability of the system; minimizing environmental impacts* on land, habitat, water quality, and air quality; and *maintaining a competitive position* relative to other California electricity providers.

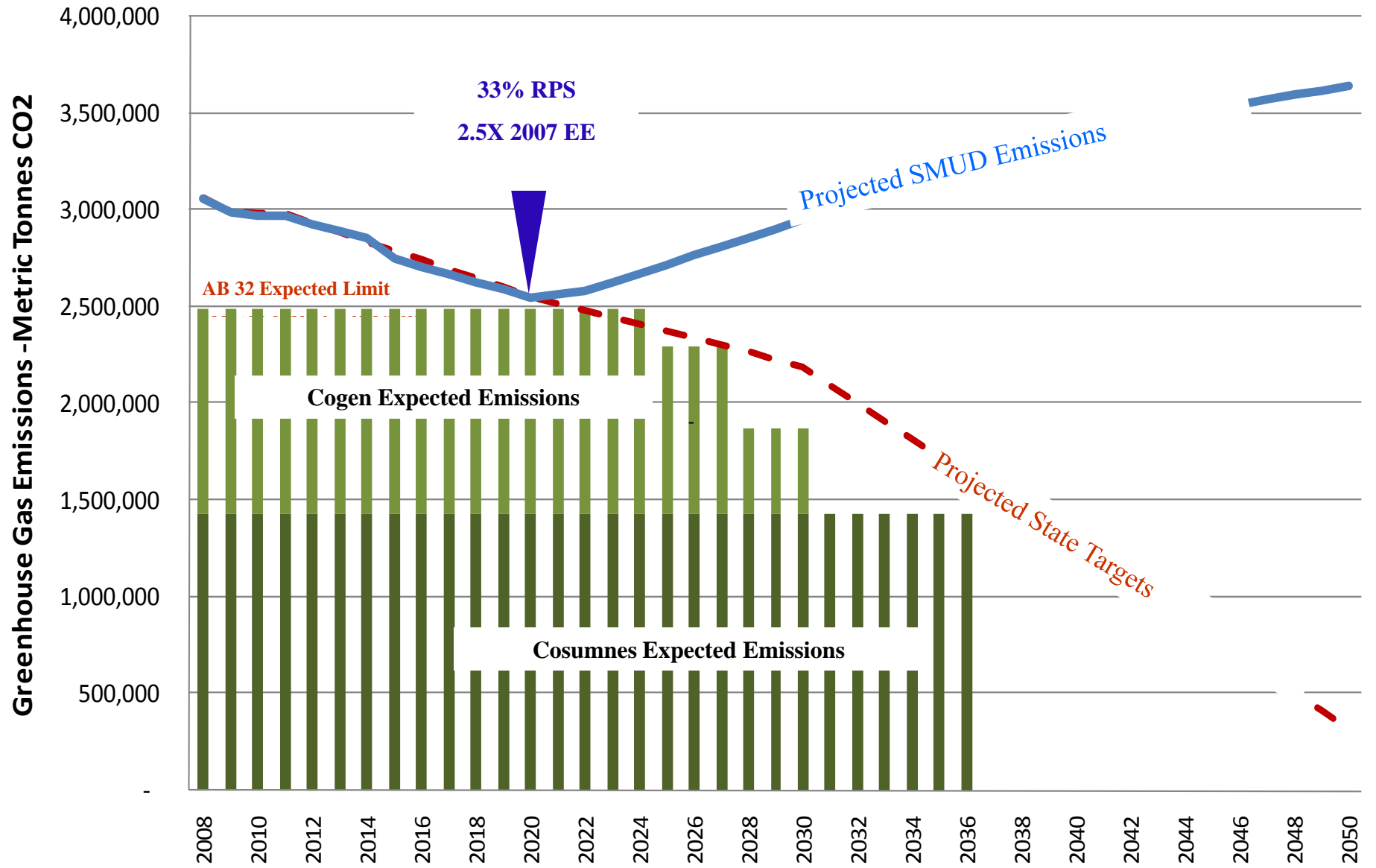
Emissions Intensities of California Utilities



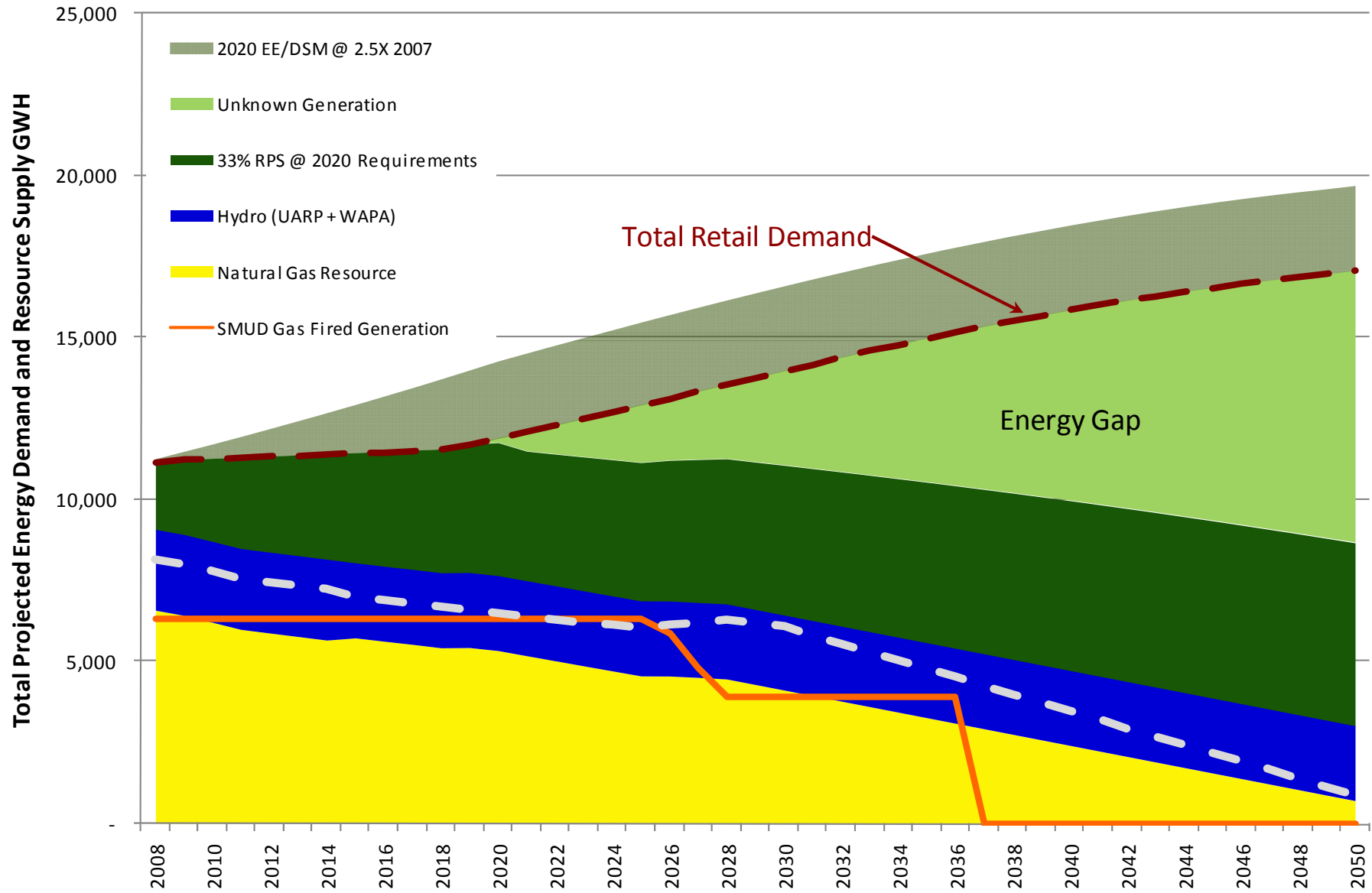
SMUD Historic and Projected Electricity Demand, Emissions, and Reduction Measures



Projected Greenhouse Gas Emissions Targets for SMUD Retail Load through 2050, SMUD Projected Emissions with 2020 RPS and EE Targets



SMUD Projected Resource Mix Through 2050



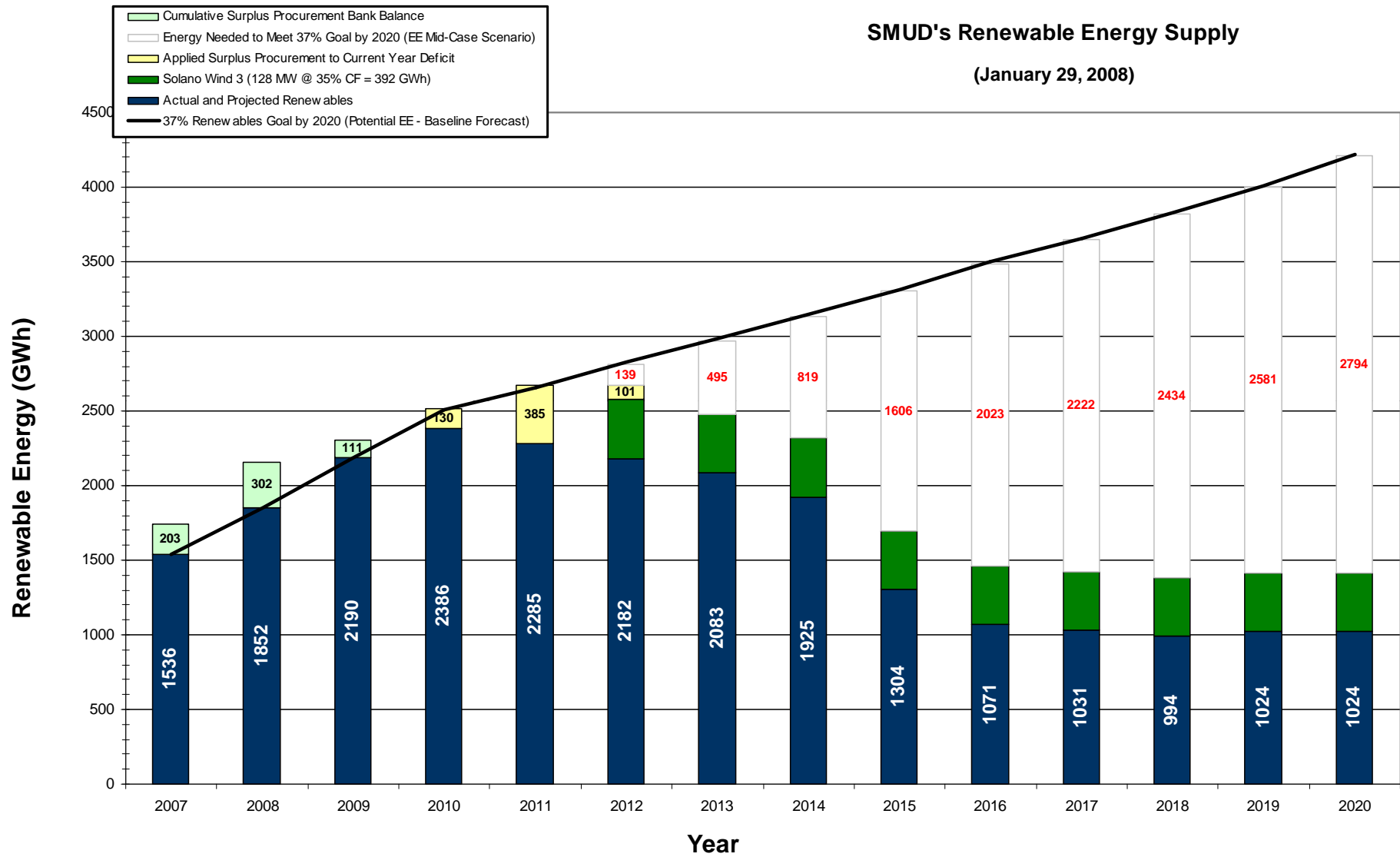
SMUD RENEWABLE GOALS

- Renewables Portfolio Standard (RPS), and Green Pricing Program ('Greenenergy')

Renewable Energy Program	2008 Supply Goal	2008 Actual (estimate)	2010 Goal	2020 Goal
RPS	14%	16.8%	20%	33%
Greenenergy	3%	3%	3%	4%
Totals	17.5%	19.8%	23%	37%

SMUD's Renewable Energy Supply

(January 29, 2008)



SMUD RENEWABLES



- SMUD Owns/Operates Renewables Plants and PPAs with IPPs
- Conduct Annual RFO for Conventional & also Emerging Renewables
- Future
 - Local projects, NE CA, Northwest, Nevada
 - Emerging technologies (e.g., solar, biomass gasification) important + address intermittency

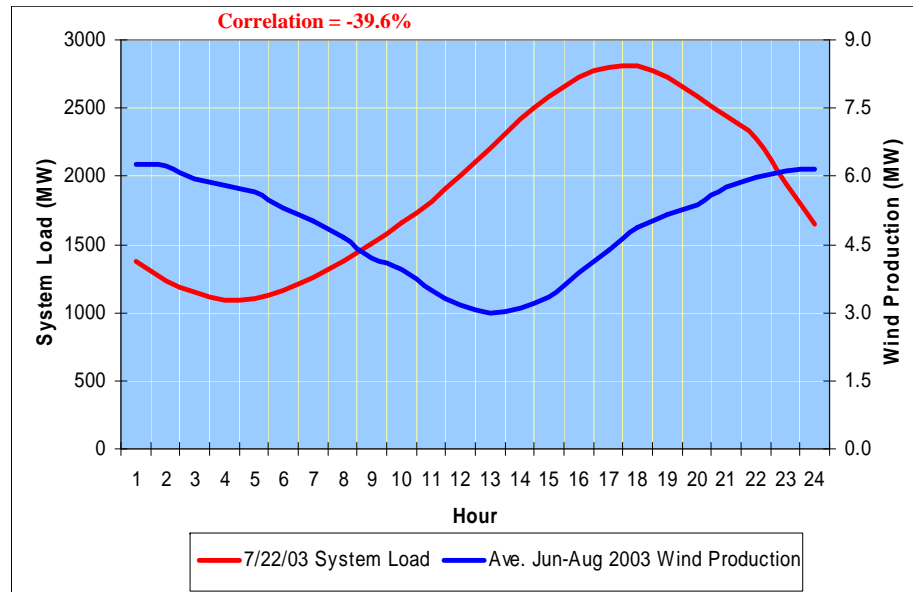
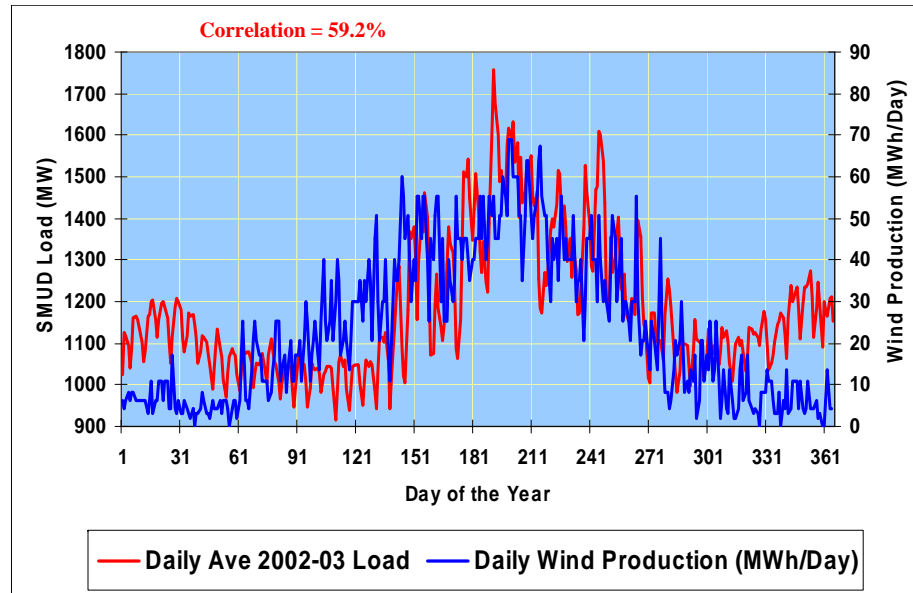
SMUD WIND



SMUD-Owned Solano Project



SMUD Wind Generation



- SMUD's peak load driven by hot summer temperatures
- Wind resource weakest on hottest days
- Comparing daily and hourly system load with Solano Wind Plant production illustrates mismatch
- Must rely on firming resources to address mismatch and ensure system stability

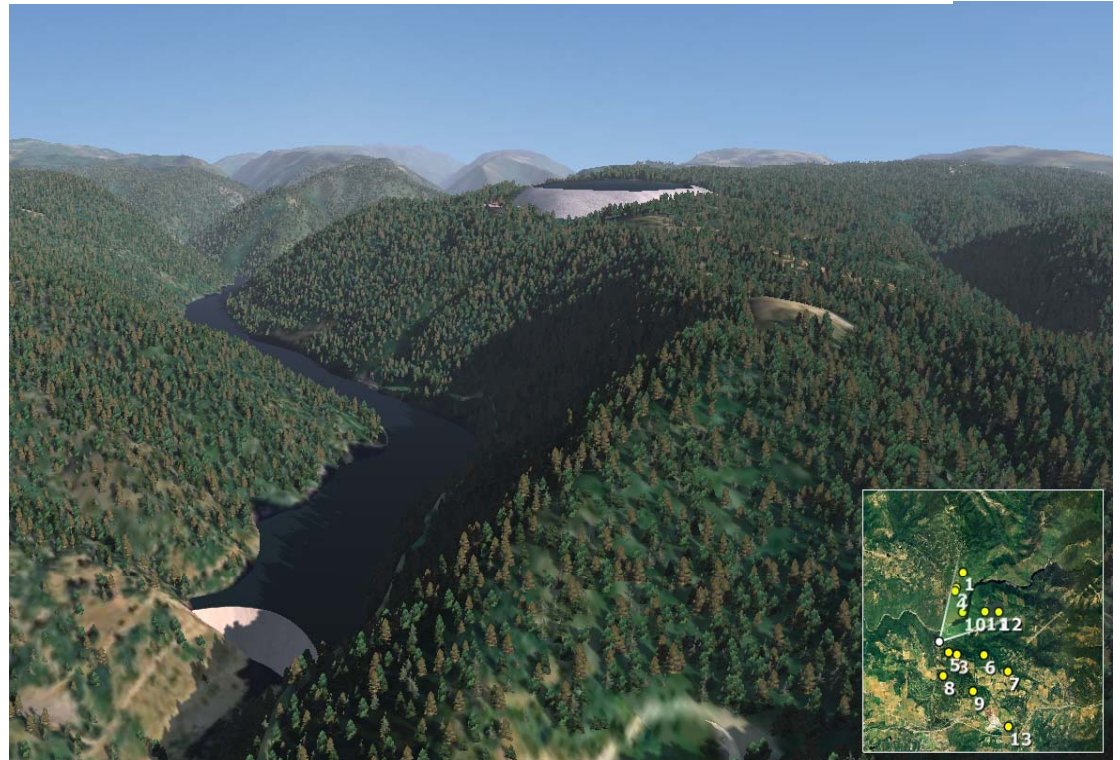
SMUD's PUMPED HYDRO STORAGE

Key Features of Iowa Hill

- Proposed to be added to existing Upper American River Project (UARP), near Placerville, CA
- 400-MW Pumped-storage facility
- New, upper 6,400 ac-ft reservoir
- Existing Slab Creek Reservoir as lower reservoir
- Underground water conveyance and powerhouse

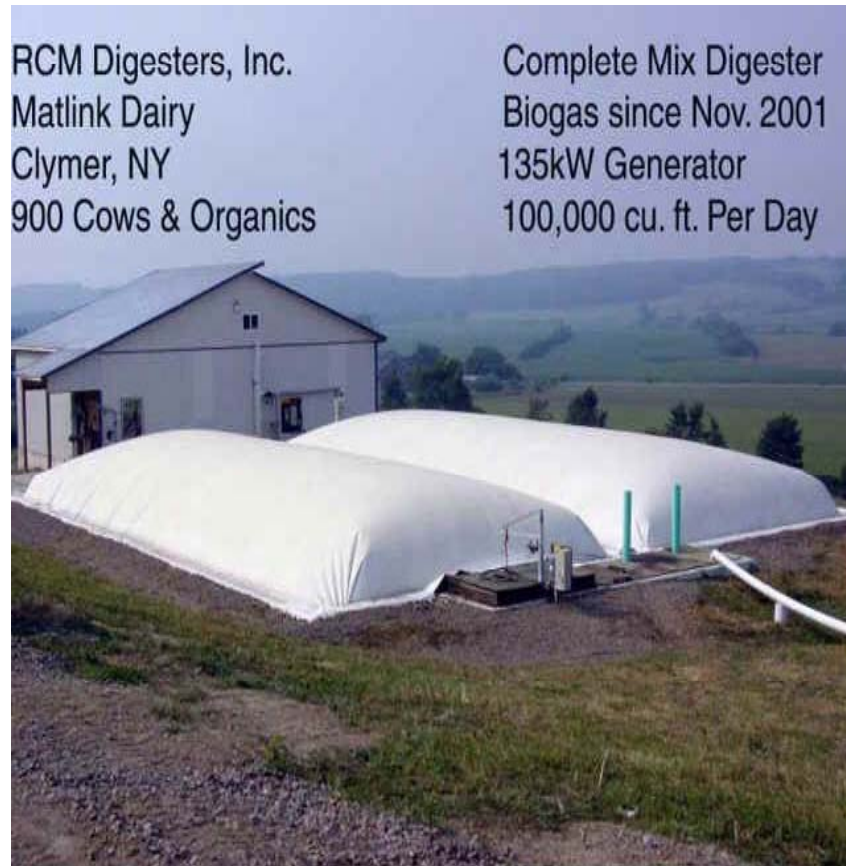
Benefits

- Helps meet load growth by increasing dependable capacity 400 MW
- Promotes intermittent, non-dispatchable renewable resources by helping to manage their energy output
- Supports load following, improves system reliability, provides voltage control and spinning reserves
- Variable-speed reversible turbines essentially deliver 800 MW of regulation value



DISTRIB GEN & STORAGE

Biomass AD



Solar PV



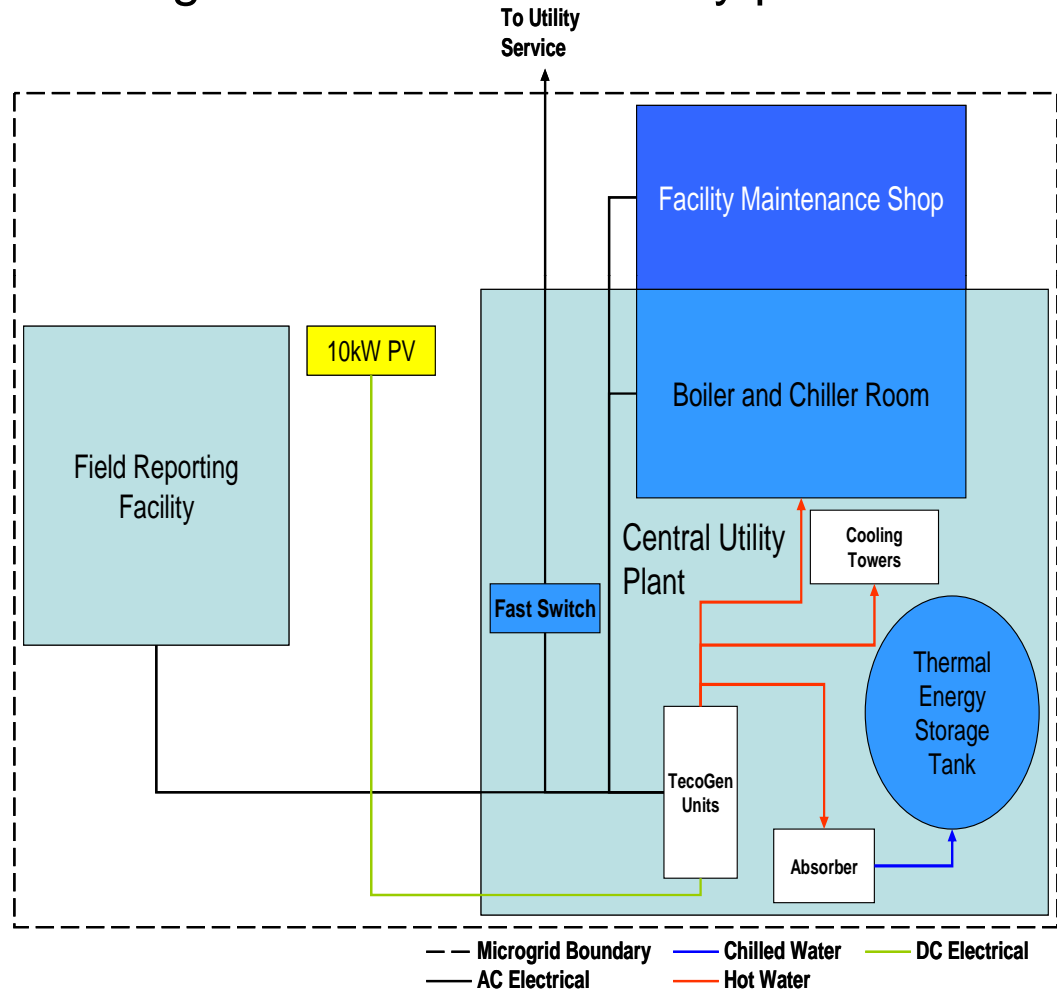
DISTRIB. GEN & STORAGE

- Renewables in Service Territory = Solar PV & Biomass Wastes (dairies, grease, food, landfills, fuel-loaded forests)
- Financial Incentives, Net Metering, Proposed Feed-In Tariff (FIT), Technical & Regulatory Support
- Cooling, Heating & Power, Dist. Storage
 - Proposed FIT
 - Railyards, Blue Diamond, several other sites

SMUD MICROGRID PROJECT

310kW demo of CEC/CERTS Microgrid for our central utility plant.

- What's a microgrid?
Integrated energy system consisting of interconnected loads and distributed energy resources which as an integrated system can operate in parallel with the grid or in an intentional island mode
- Objectives of SMUD project
 - Real world performance
 - Integration and interoperability with demand responsive load control, advanced reciprocating engines, PV, and thermal energy storage
 - Seamless separation and isolation from utility grid and resynchronization
 - Feeder peak load reduction
- 3-year PIER project, \$2.9M



Functionality Provided By Smart Grid

Smart Grid systems support better communications and control between distributed resources and utility T&D system – thus enabling sustainable power supplies and enhanced grid reliability.

