CALIFORNIA'S POLICY GOALS & SMART GRID

IEPR Workshop – 5/14/09

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SMUD

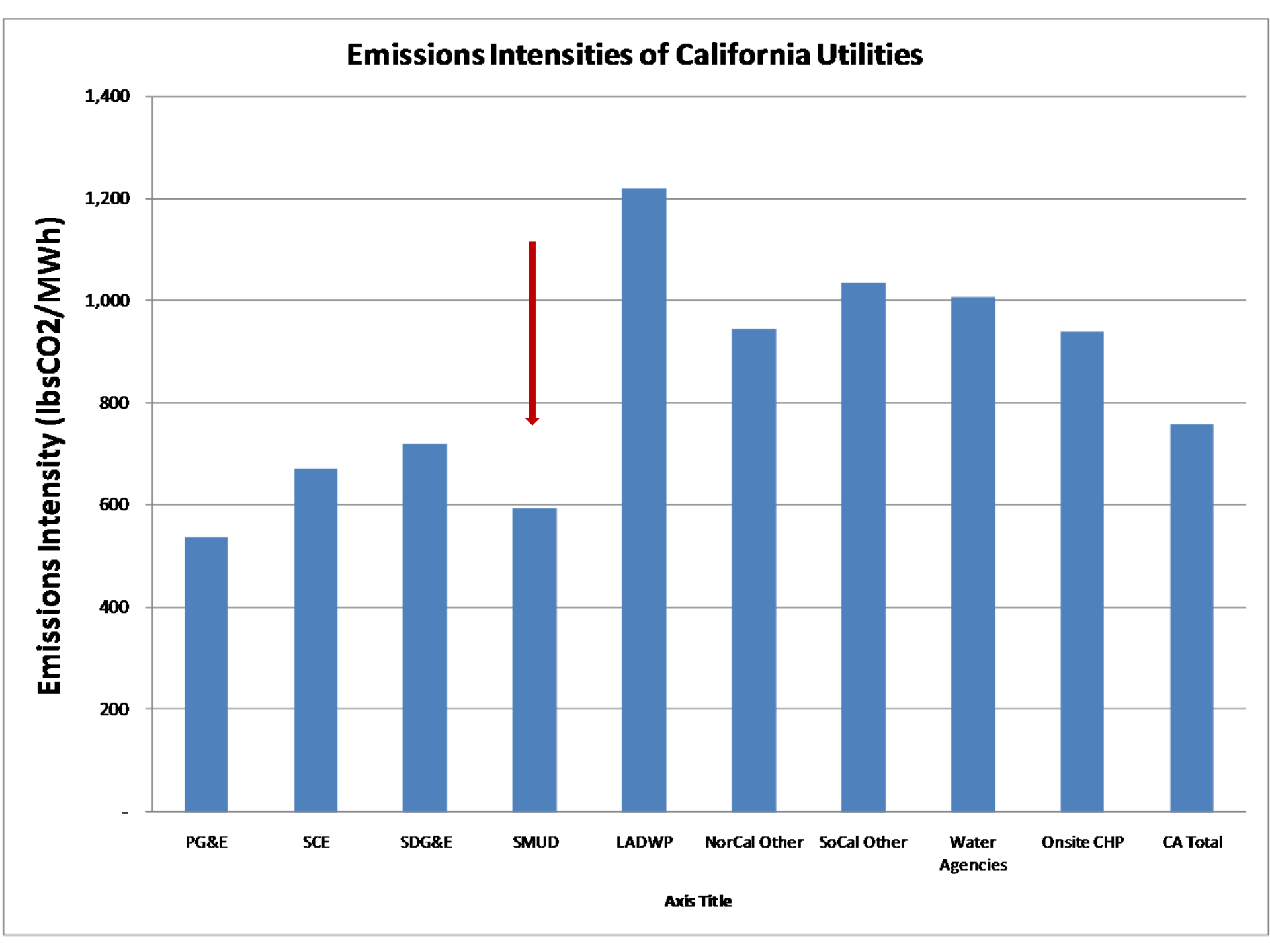
SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT
The Power To Do More.℠

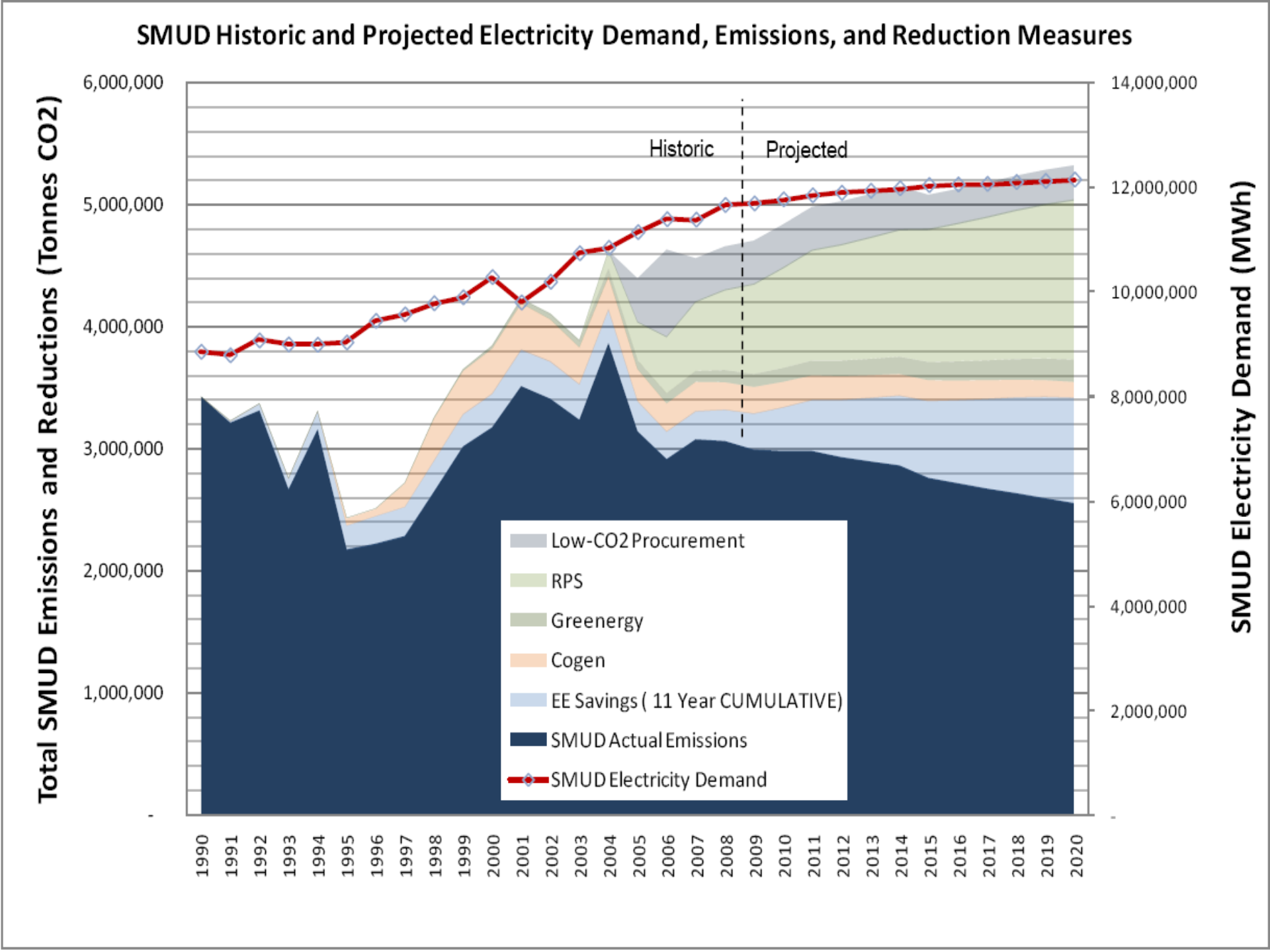
SUMMARY

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

SMUD BOARD DEFINTION

- 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
Emissions Intensity (lbsCO2/MWh)
1,400
1,200
1,000
800
600
400
200
-
PG&E
SCE
SDG&E
SMUD
LADWP
NorCal Other
SoCal Other
Water Agencies
Onsite CHP
CA Total
Axis Title


SMUD Historic and Projected Electricity Demand, Emissions, and Reduction Measures
Total SMUD Emissions and Reductions (Tonnes CO2)
SMUD Electricity Demand (MWh)
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
-
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
-
Historic
Projected
Low-CO2 Procurement
RPS
Greenergy
Cogen
EE Savings (11 Year CUMULATIVE)
SMUD Actual Emissions
SMUD Electricity Demand
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
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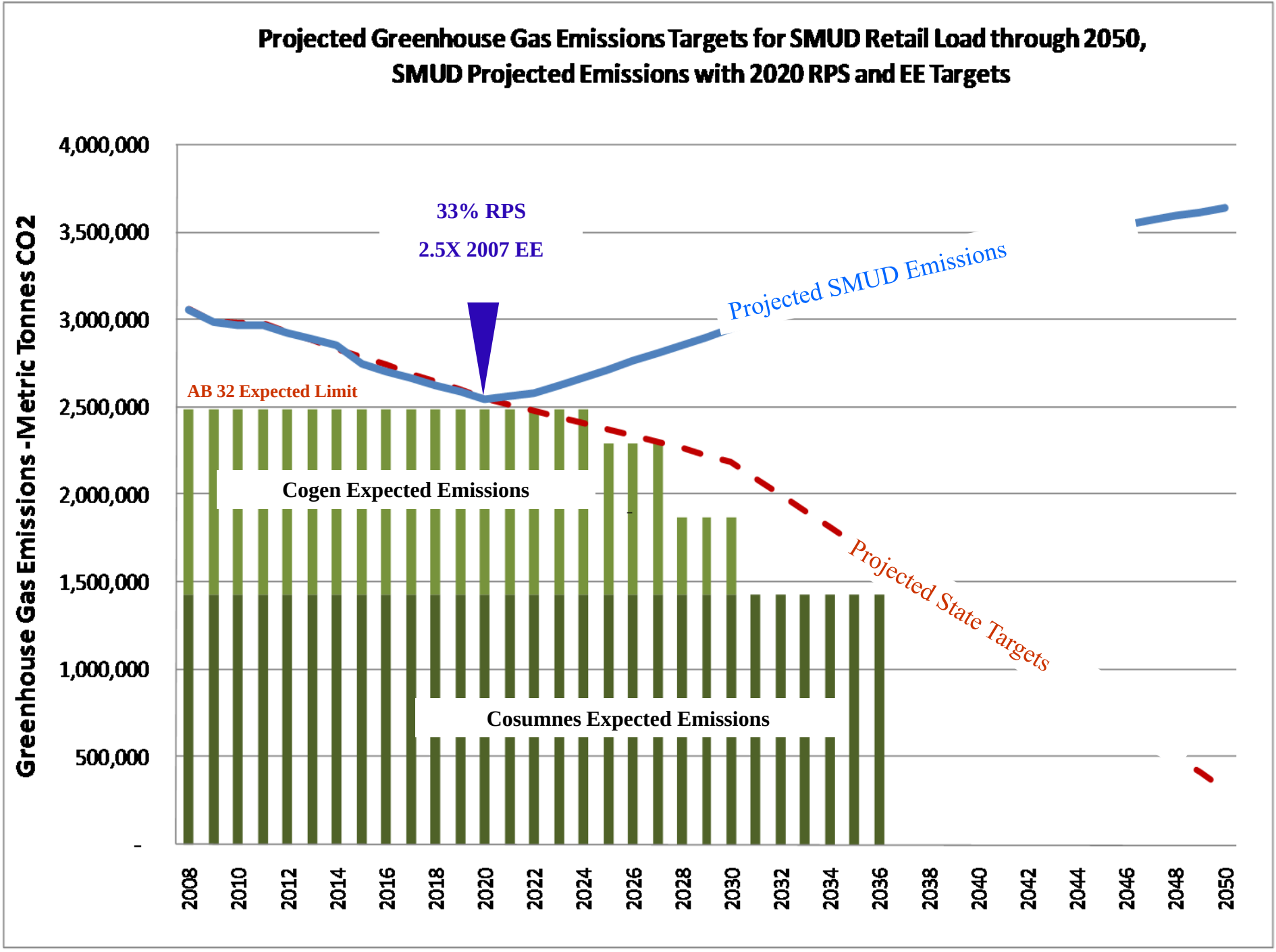
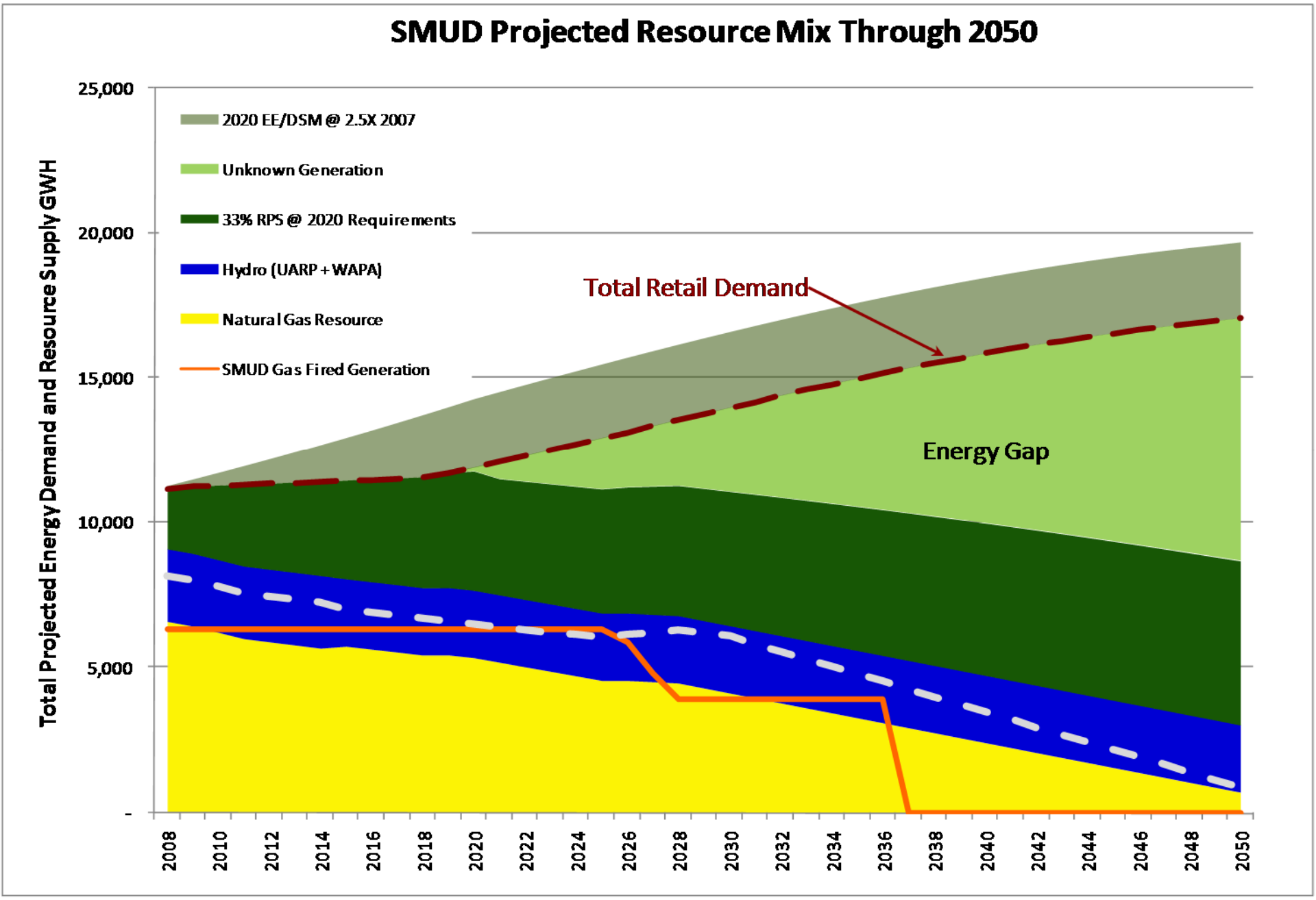
2014
2015
2016
2017
2018
2019
2020


Projected Greenhouse Gas Emissions Targets for SMUD Retail Load through 2050,
SMUD Projected Emissions with 2020 RPS and EE Targets
Greenhouse Gas Emissions - Metric Tonnes CO2
4,000,000
3,500,000
3,000,000
2,500,000
2,000,000
1,500,000
1,000,000
500,000
-
33% RPS
2.5X 2007 EE
Projected SMUD Emissions
AB 32 Expected Limit
Cogen Expected Emissions
Projected State Targets
Cosumnes Expected Emissions
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050

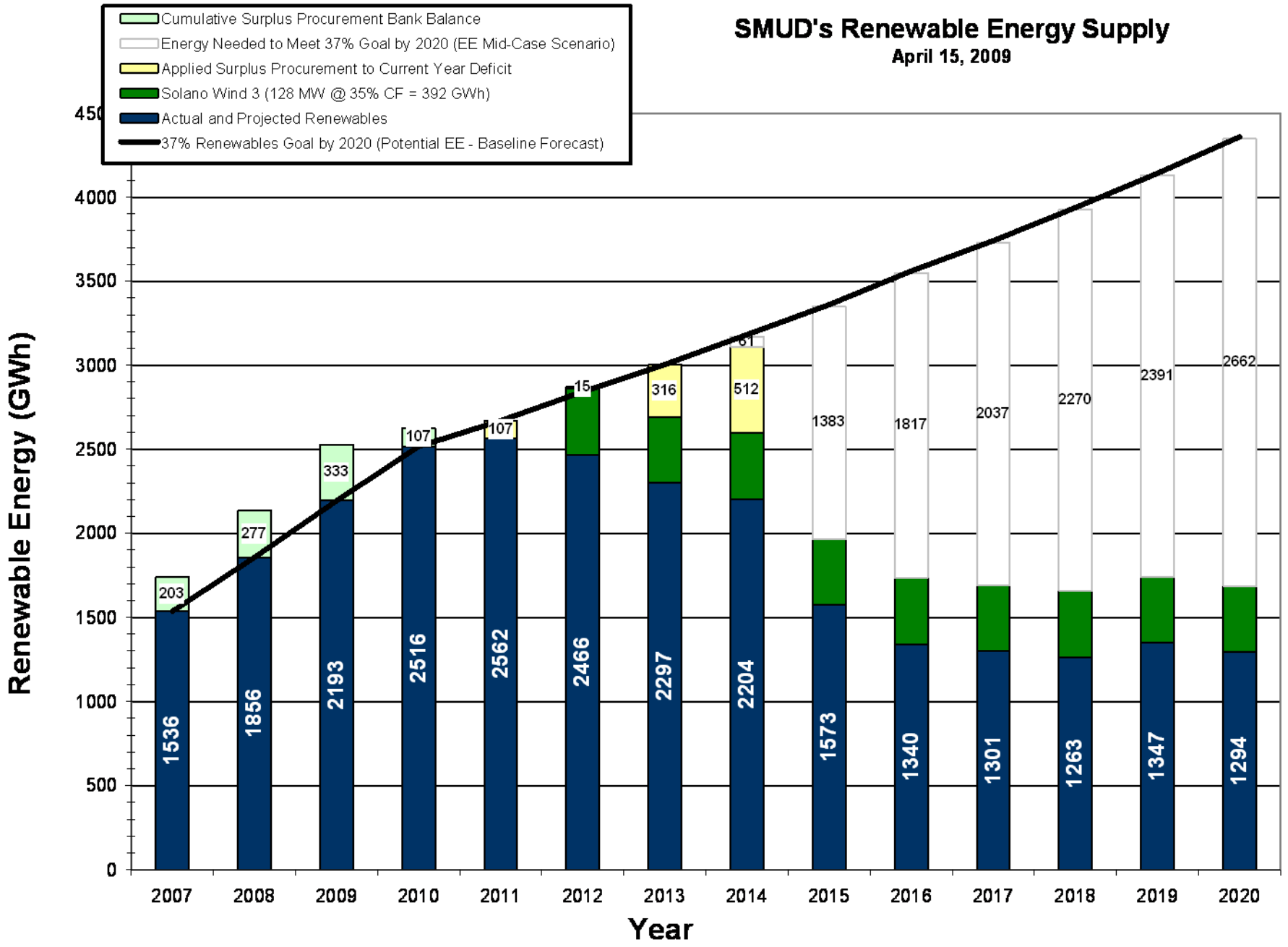
SMUD Projected Resource Mix Through 2050



SMUD RENEWABLE GOALS

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

Renewable Energy Program	2008 Supply Goal	2008 Actual (estimate)	2010 Goal	2020 Goal
RPS	14%	16.5%	20%	33%
Greenergy	3%	3%	3%	4%
Totals	17.5%	19.5%	23%	37%


SMUD's Renewable Energy Supply
April 15, 2009
Cumulative Surplus Procurement Bank Balance
Energy Needed to Meet 37% Goal by 2020 (EE Mid-Case Scenario)
Applied Surplus Procurement to Current Year Deficit
Solano Wind 3 (128 MW @ 35% CF = 392 GWh)
Actual and Projected Renewables
37% Renewables Goal by 2020 (Potential EE - Baseline Forecast)
Renewable Energy (GWh)
Year
0
500
1000
1500
2000
2500
3000
3500
4000
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
203
277
333
107
107
15
316
512
61
1383
1817
2037
2270
2391
2662
1536
1856
2193
2516
2562
2466
2297
2204
1573
1340
1301
1263
1347
1294

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

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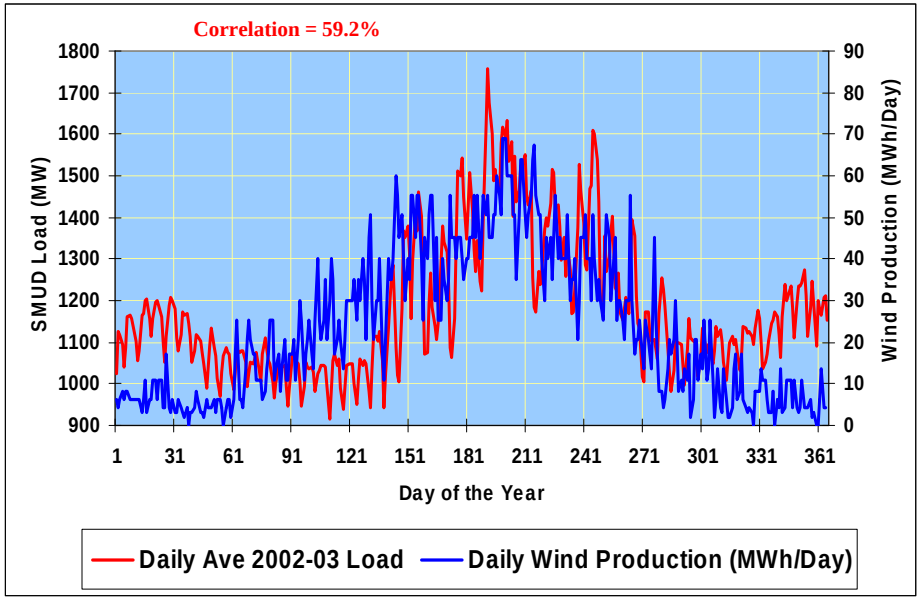
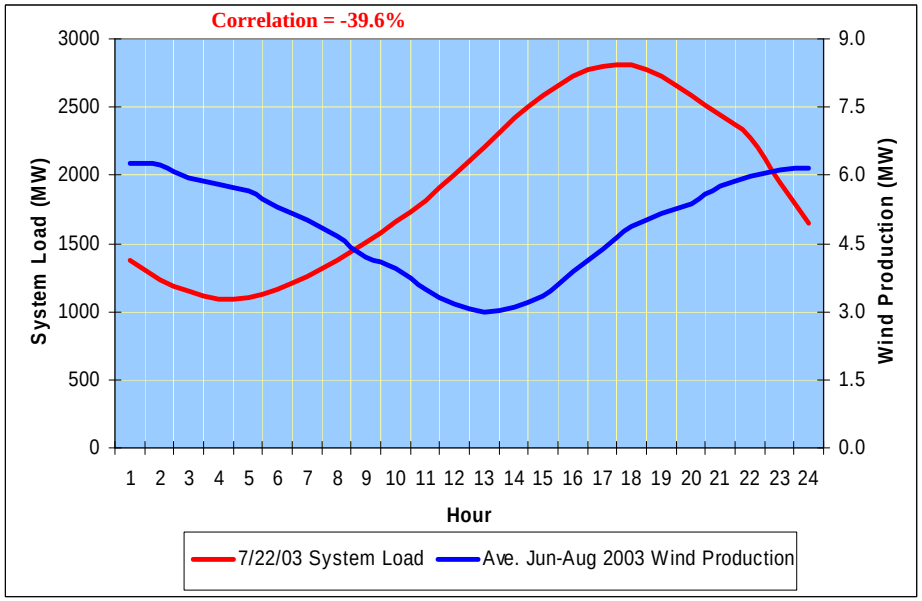
SMUD Wind Generation





- 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

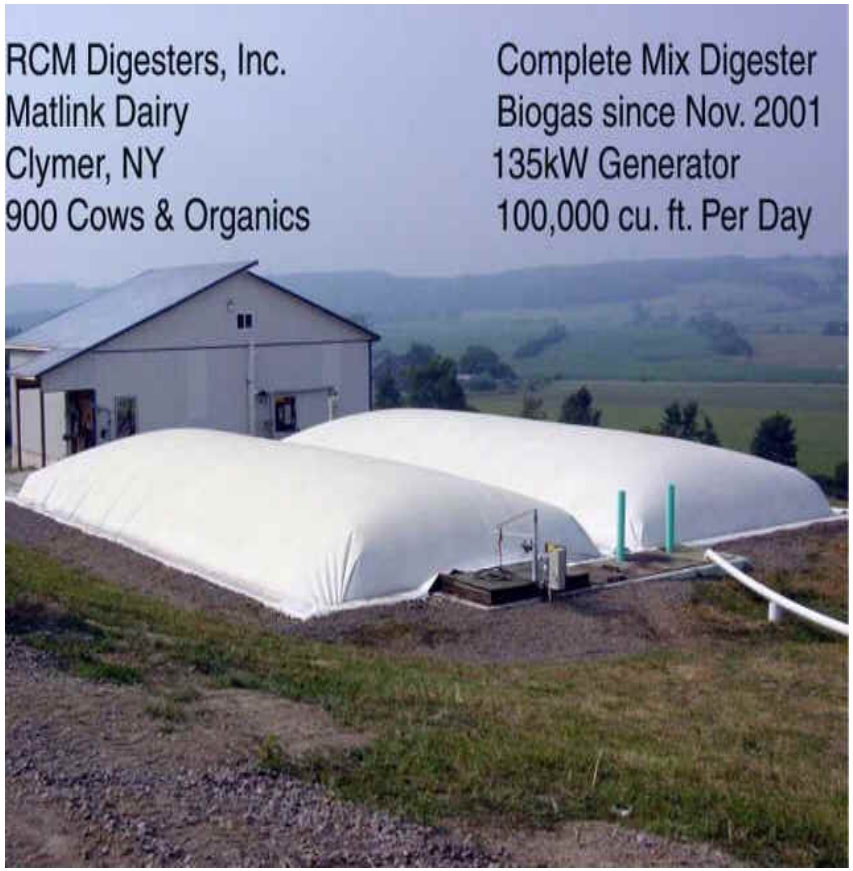
- Proposed to be added to existing Upper American River Project (UARP), near Placerville, CA
- 400-MW Pumped-storage facility
- New, upper 6,400 ac-ft reservoir
- Existing Slab Creek Reservoir as lower reservoir
- Underground water conveyance and powerhouse

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

Biomas 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 DG FIT
  - Railyards, Blue Diamond, several other sites

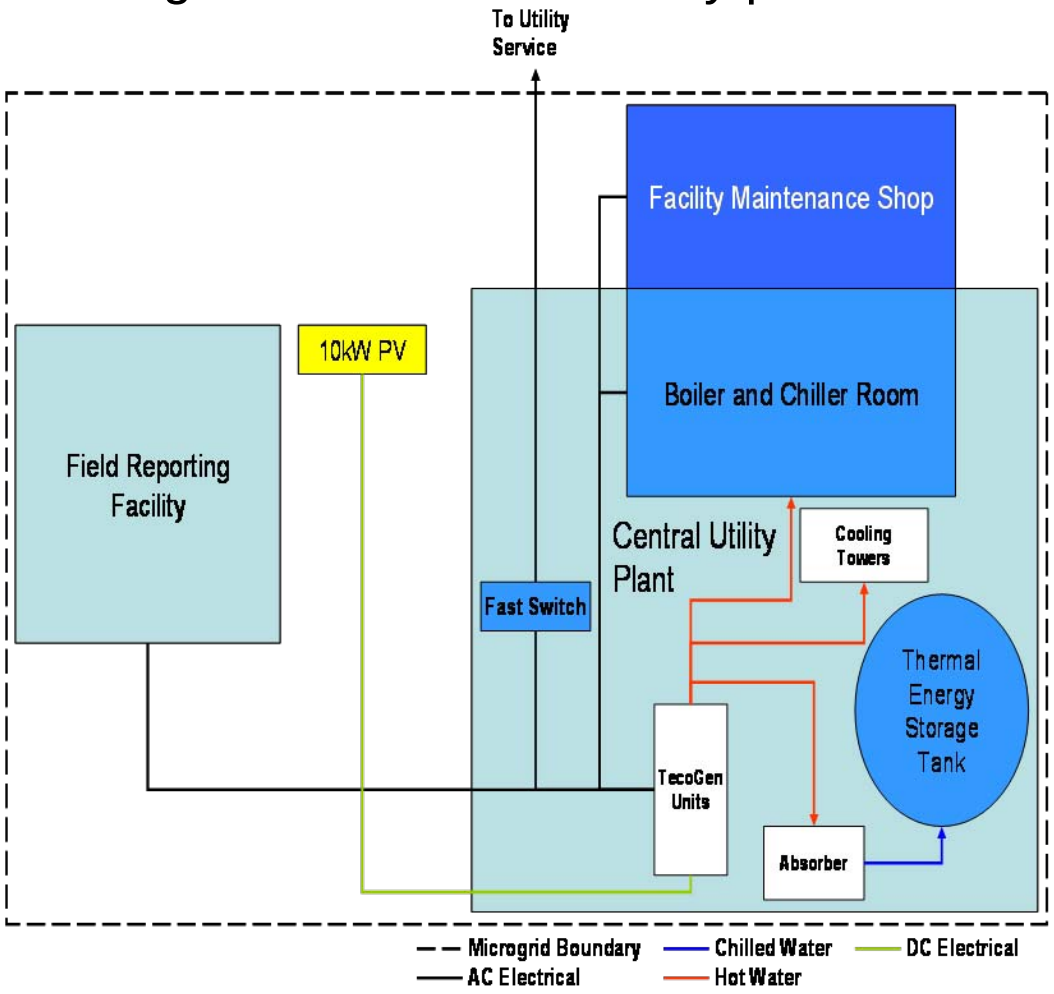
SMUD MICROGRID PROJECT

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

- What's a microgrid?

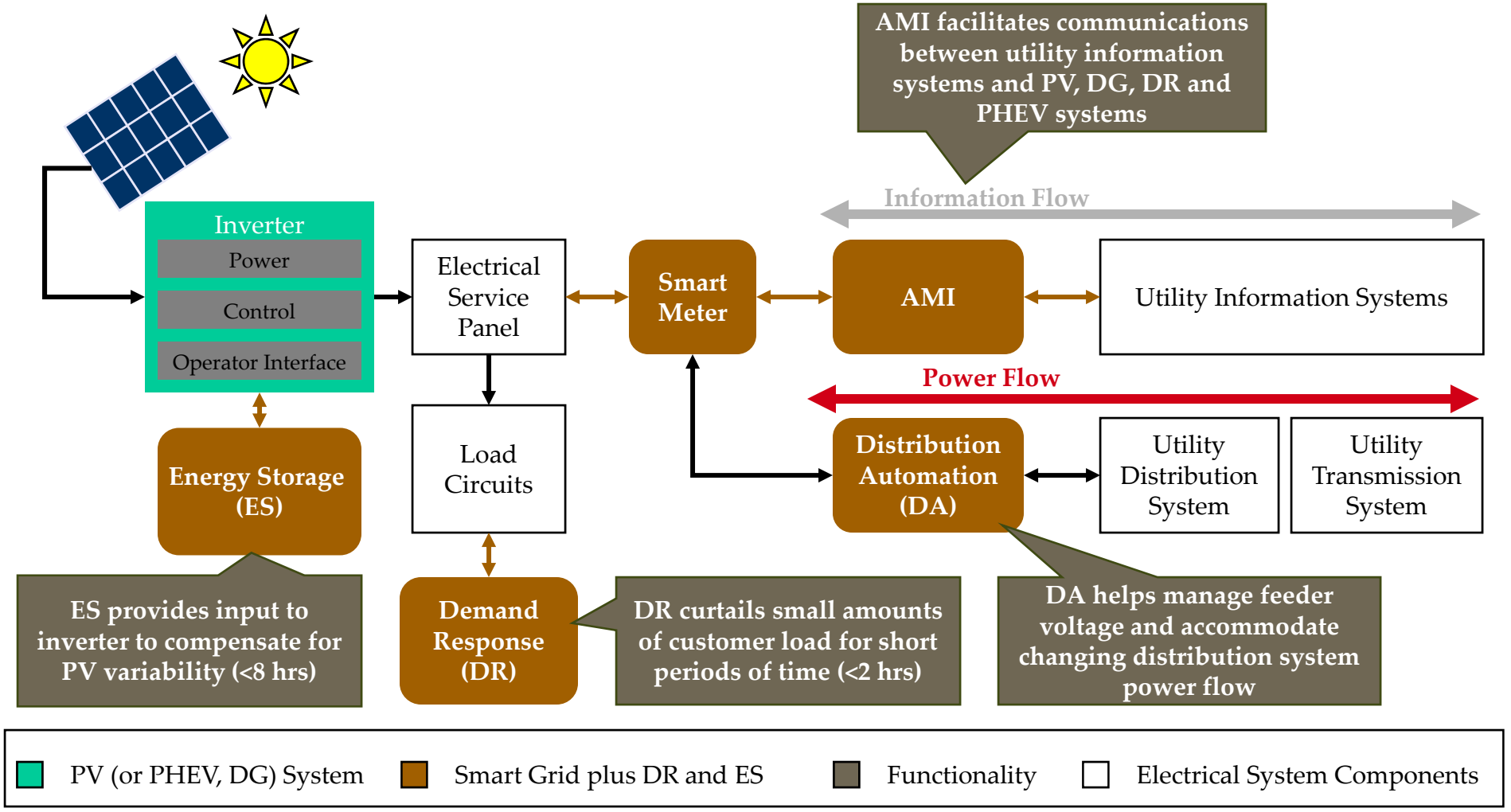
  Integrated energy system consisting of interconnected loads and distributed energy resources which as an integrated system can operate in parallel with the grid or in an intentional island mode

- 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.



Source: Adapted from Navigant Consulting, *The Convergence of the Smart Grid with Photovoltaics Study,* January 2009