U.S. Regional Approaches to Energy Policy and CO_2 Mitigation

The California Experience

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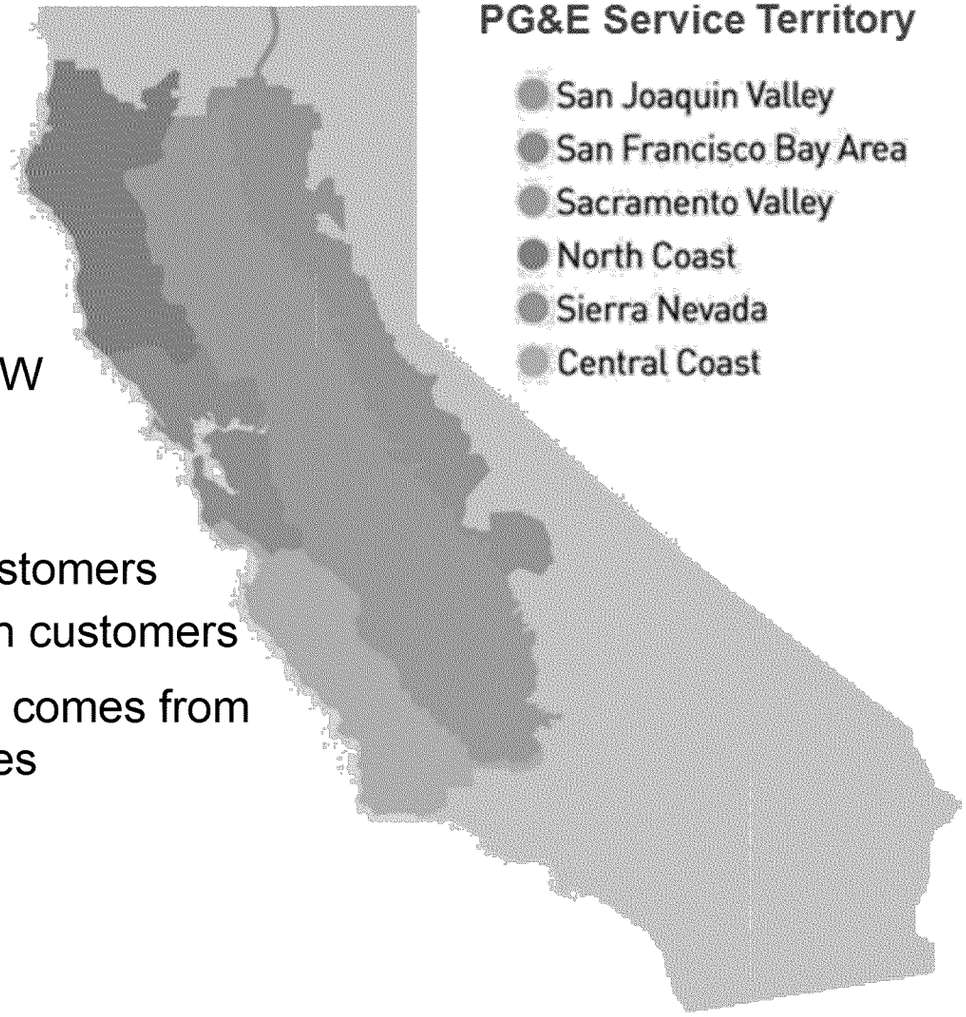
Topics for Discussion

- Programs aimed at reducing greenhouse gas (GHG) emissions
- PG&E's emissions
- Key issues
- What's next?

PG&E – Company Overview

Company Facts

- Over 21,000 employees
- 70,000 square-mile service territory
- $15.6 billion in revenues
- Peak electricity demand: ~20,000 MW
- Over 15 million people served
  … about 1 in 20 Americans
  - 5.2 million electric distribution customers
  - 4.4 million natural gas distribution customers
- Over 50% of PG&E's electric supply comes from non-greenhouse gas emitting facilities



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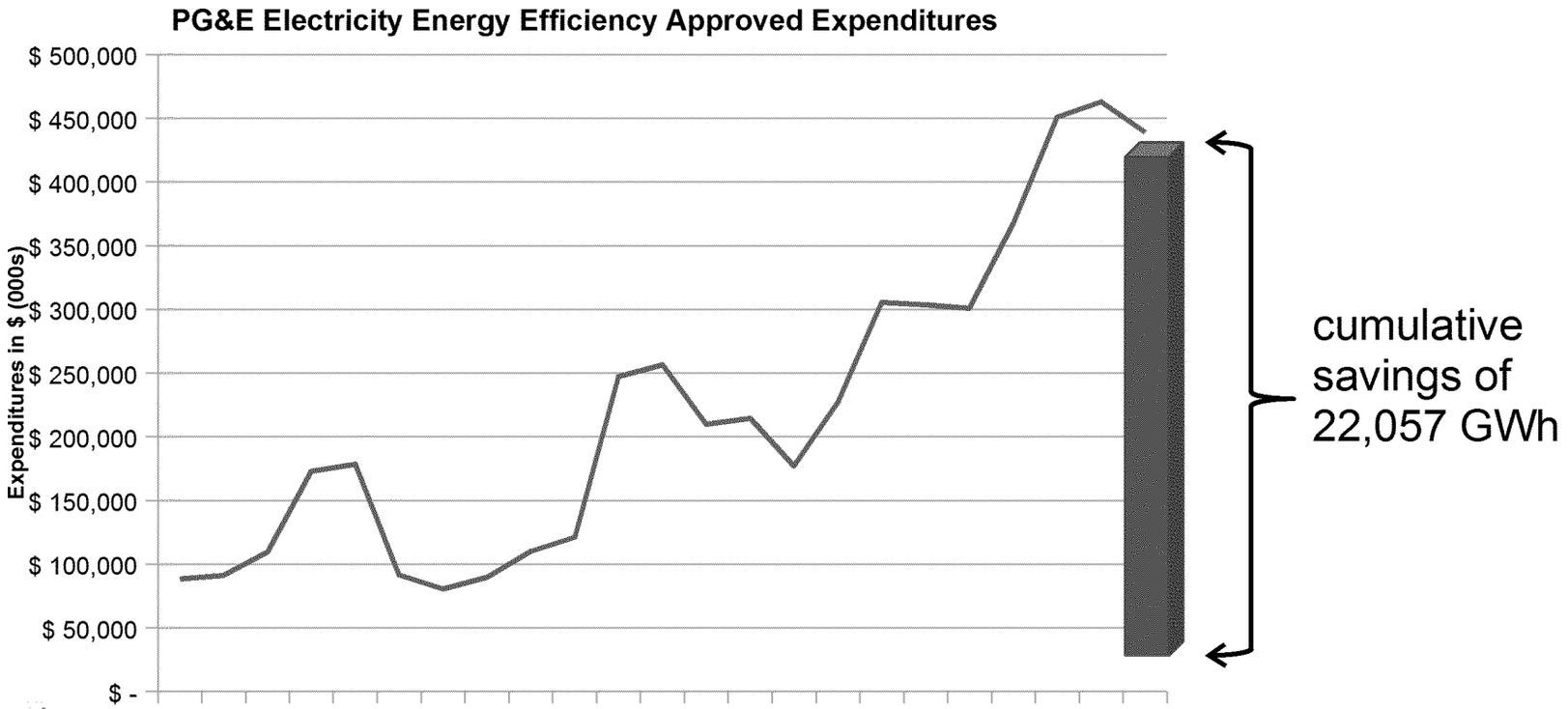
Electric Energy Efficiency

- Energy efficiency funding was first adopted by the California Public Utilities Commission in late 1970s
- Funding for PG&E's electric programs has grown from ~$88.5 million in 1990 to nearly $440 million in 2012



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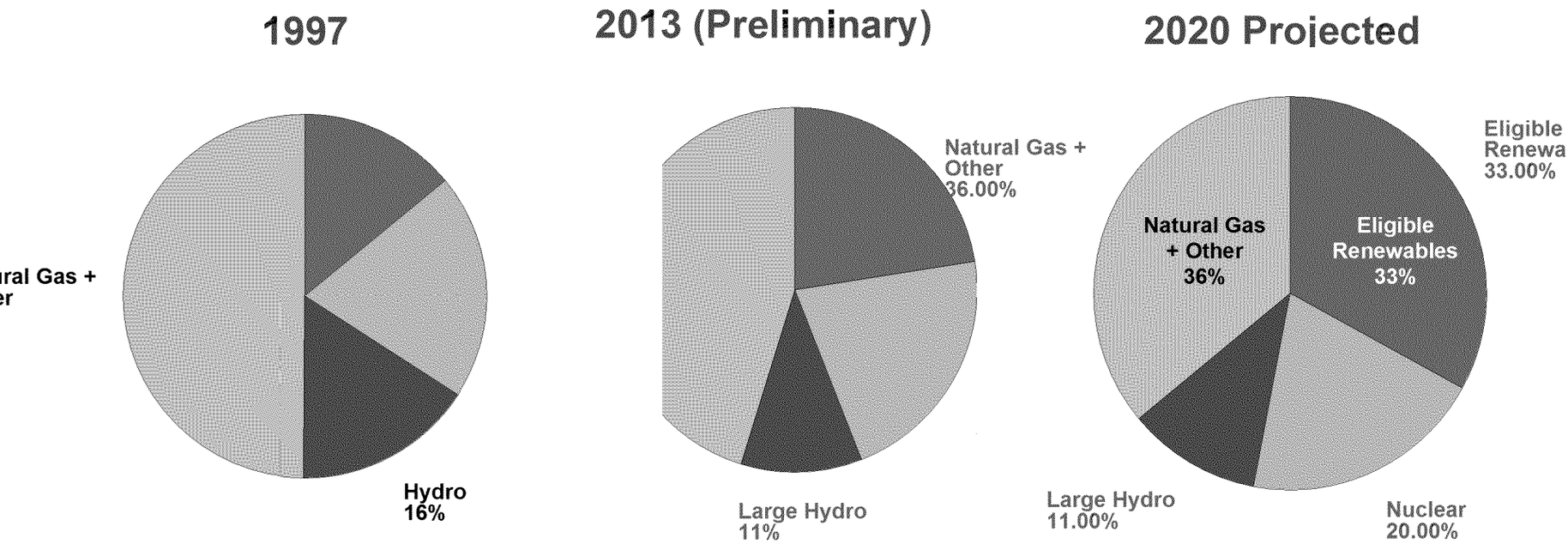
California's Renewable Portfolio Standard (RPS)

- First adopted by state legislature in 2002
  - Required 20% renewables by 2017
  - Large hydro (above 30 MW) not considered "renewable"
- In 2006, goal was accelerated to 20% by 2010
- In 2011, target was increased to 33% by 2020

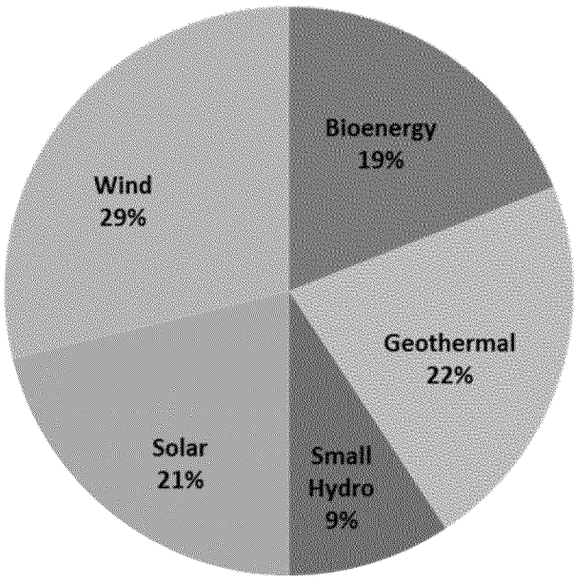
PG&E's Electric Resource Mix Over Time



- *"Other" includes market purchases and other fossil resources.*
- *1997 data from PG&E's 1997 10K Report (report issued in spring 1998).*
- *2013 statistics are subject to independent audit and verification that will not be completed until October 2014.*

Sources of Renewable Power – Today and in 2020

2013 Preliminary
22% of total bundled retail sales



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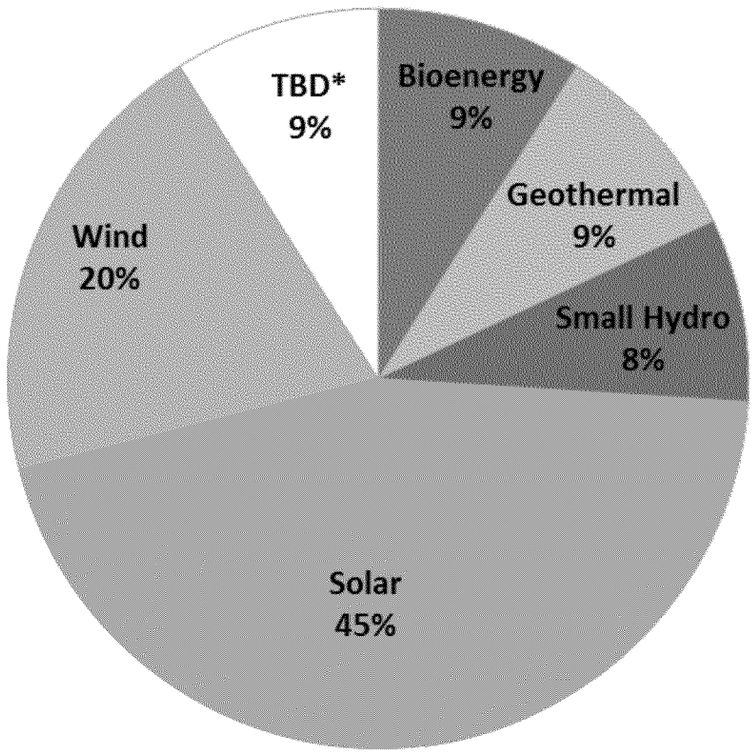
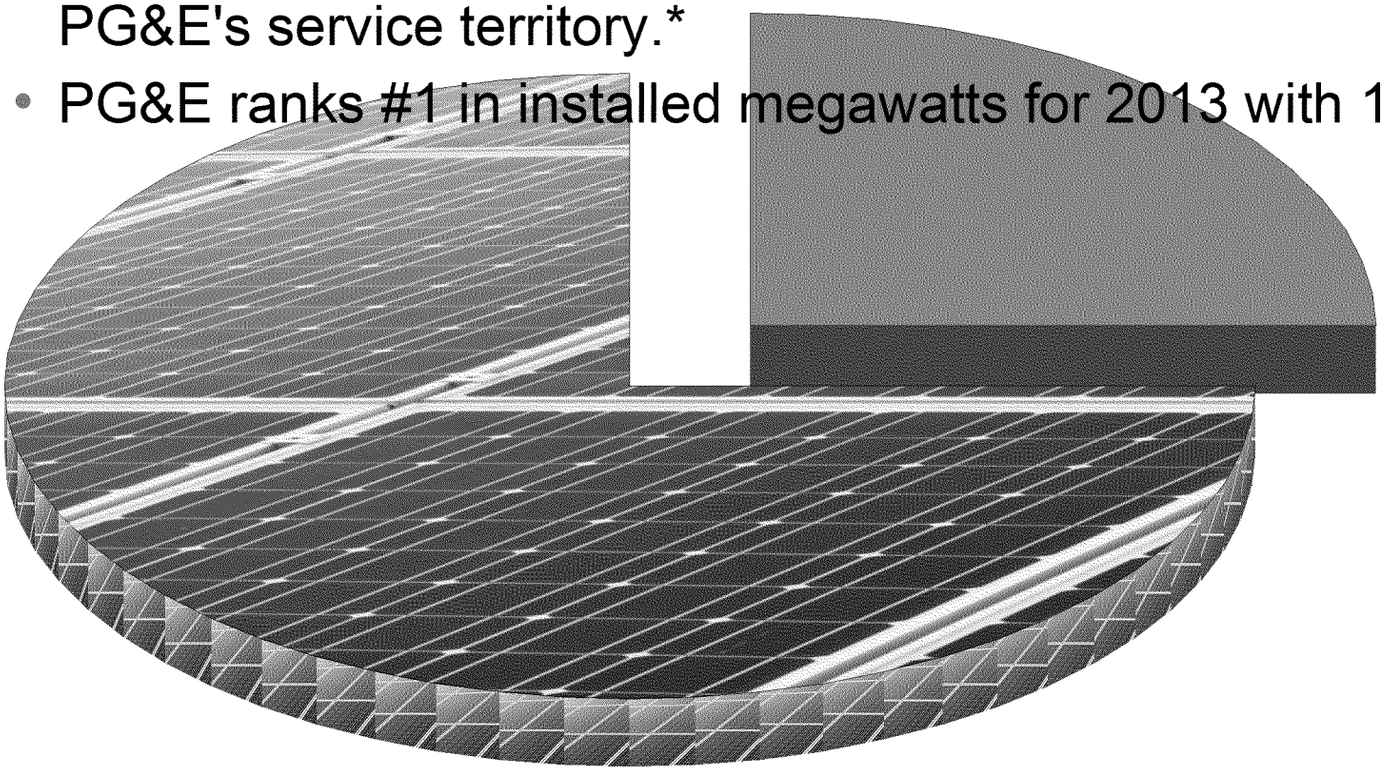
2020 Projected
33% of total bundled retail sales



Source: PG&E's 2013 10-K filing and PG&E's 2013 IEPR Forecast. Last updated February 2014.

PG&E a Leader in Retail Solar Photovoltaic

- One-fourth of customer solar installations in the U.S. are in PG&E's service territory.*
- PG&E ranks #1 in installed megawatts for 2013 with 1,470 MW.**



** 2012 Solar Electric Power Association Annual Survey (full 2013 dataset not yet available)*
** * 2013 Solar Electric Power Association Rankings*

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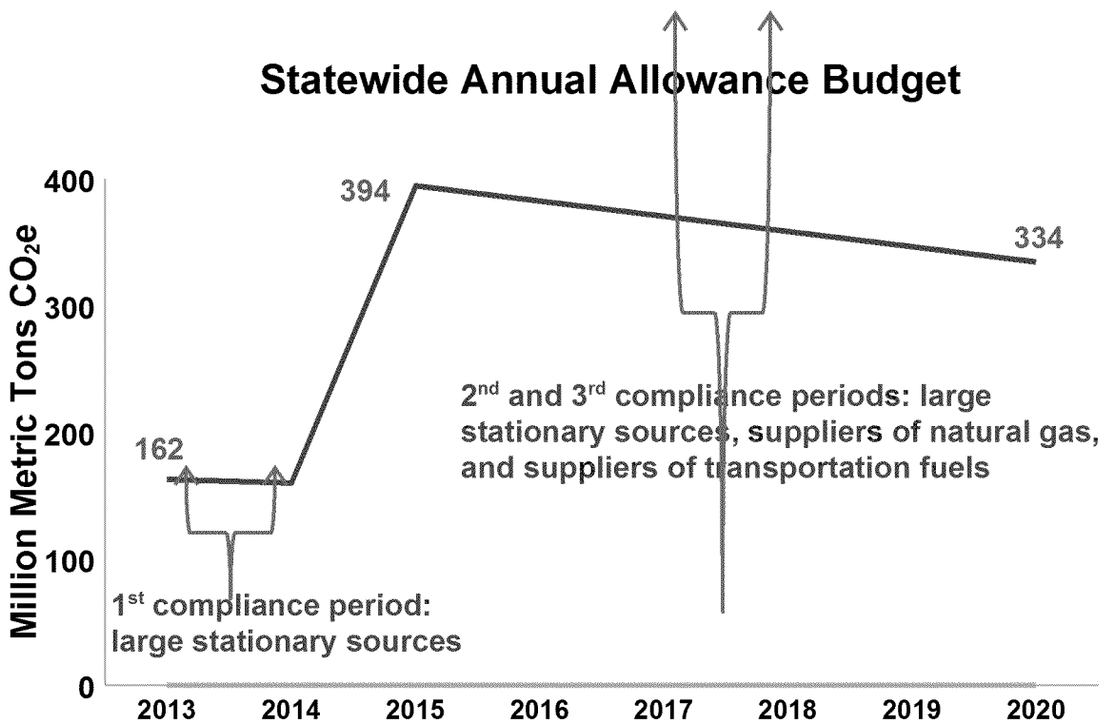
Assembly Bill 32

- Signed into law in 2006; first mandatory greenhouse gas (GHG) reduction law in US
- Requires California to reduce GHG emissions to 1990 levels by 2020 (431 million metric tons (MMT))
  - 15% decrease from 2020 business-as-usual forecast of 509 MMT
- Required California Air Resources Board (ARB) to develop plan to achieve reductions (e.g., low carbon fuel standard, RPS, Cap-and-Trade)
- Cap-and-Trade compliance obligations for electric generating facilities and imported electricity began on January 1, 2013

California's Cap-and-Trade Program

- Economy-wide program (covers 85% of the California economy)
- Number of emissions allowances available in the market declines over time
- Options for compliance: direct reductions, allowances, offsets



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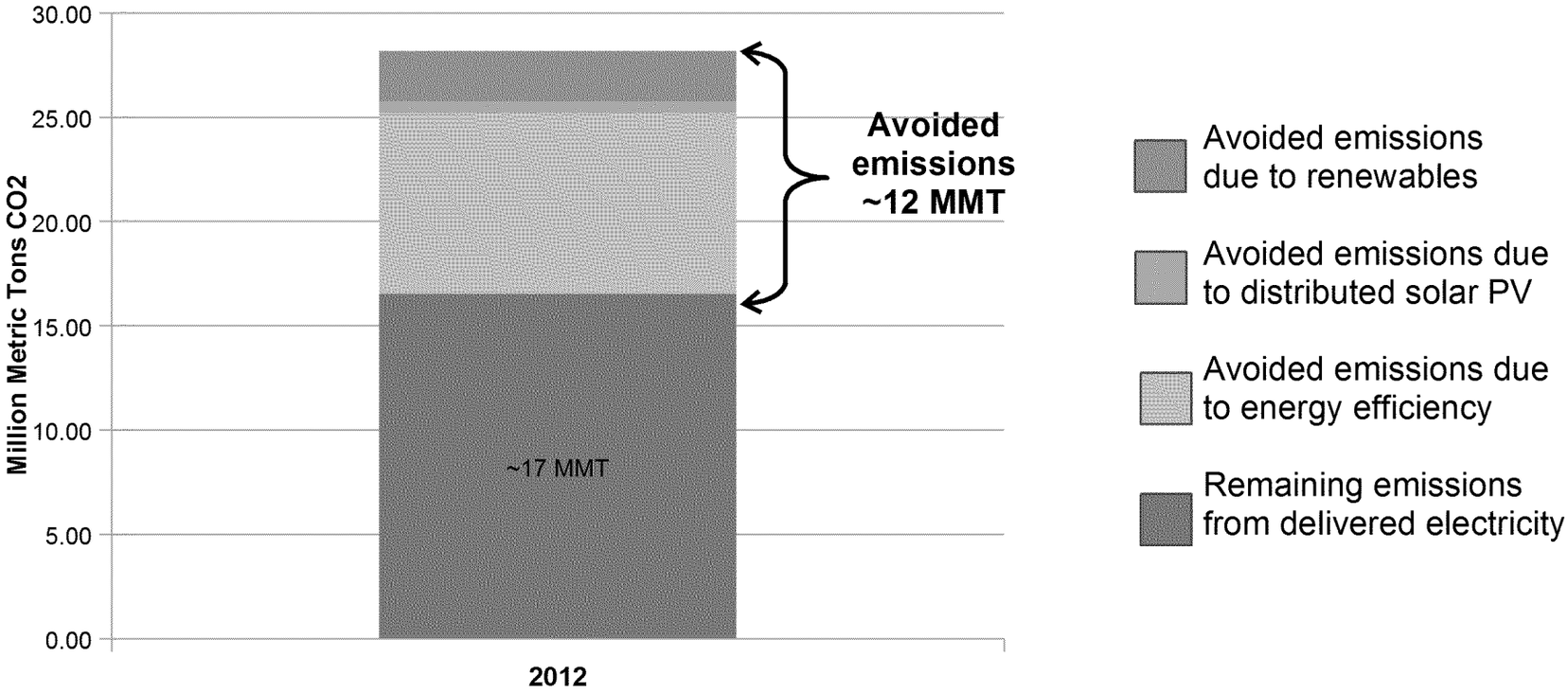
Adding It Up: PG&E's Avoided Emissions

Emissions Avoided in 2012 Due to Added RPS-Eligible Renewables, Electric Energy E

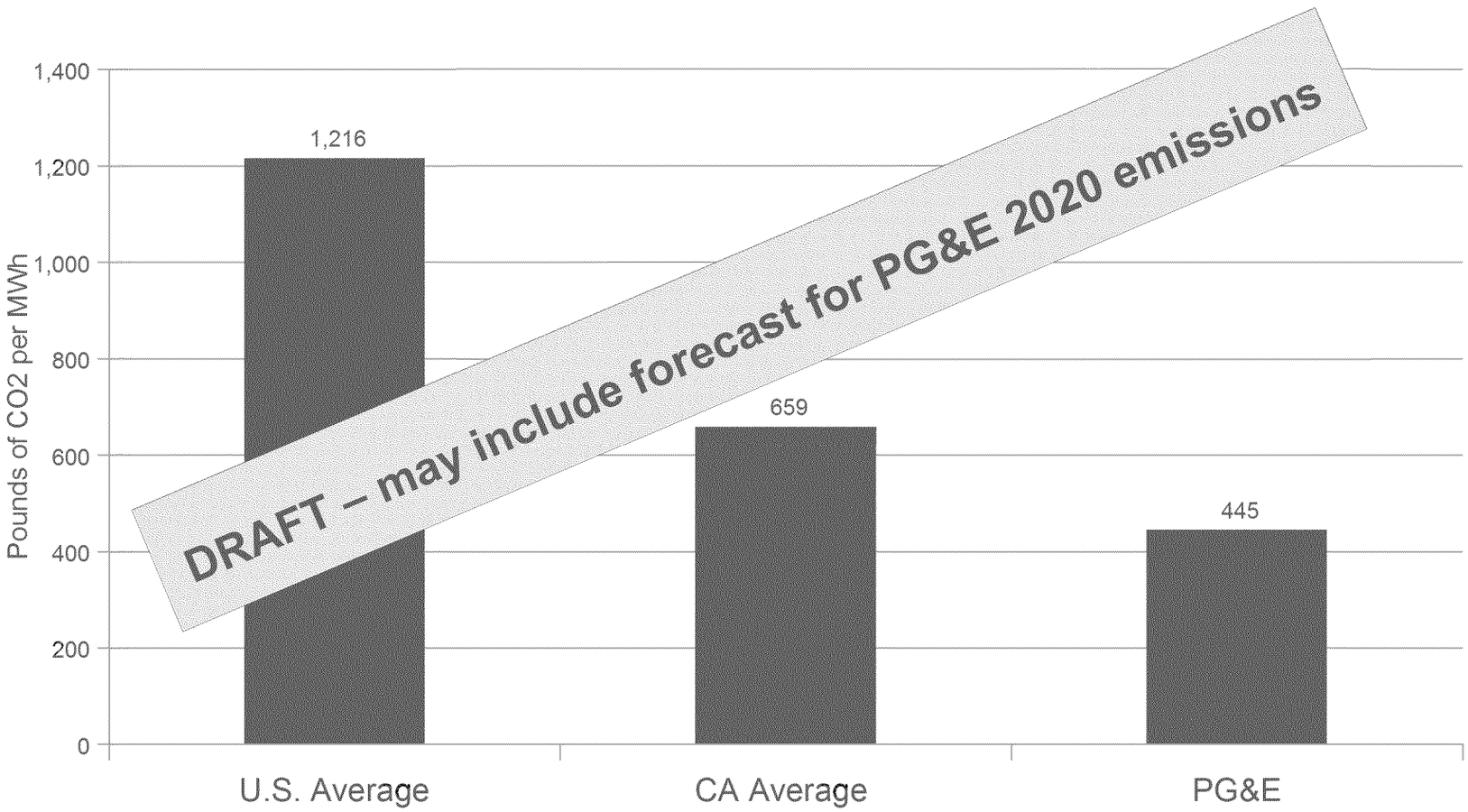


**ARB unspecified electricity emissions rate used to calculate total avoided emissions in 2012 for resources added since 2004.*

*** Delivered electricity emissions rate calculated using plant-specific emission factors, rates corresponding to fuel type when plant-specific factors were not available, and ARB's unspecified rate for any unspecified power.*

How We Compare

Benchmarking CO2 Emissions for Delivered Electricity



Sources:
US/CA averages – US Environmental Protection Agency eGRID2012 Version 1.0, which contains year 2009 information configured to reflect the electric power industry's current structure as of May 10, 2012.
PG&E – The Climate Registry, a third party verification of greenhouse gas emissions data.

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Key Issues

Cost:

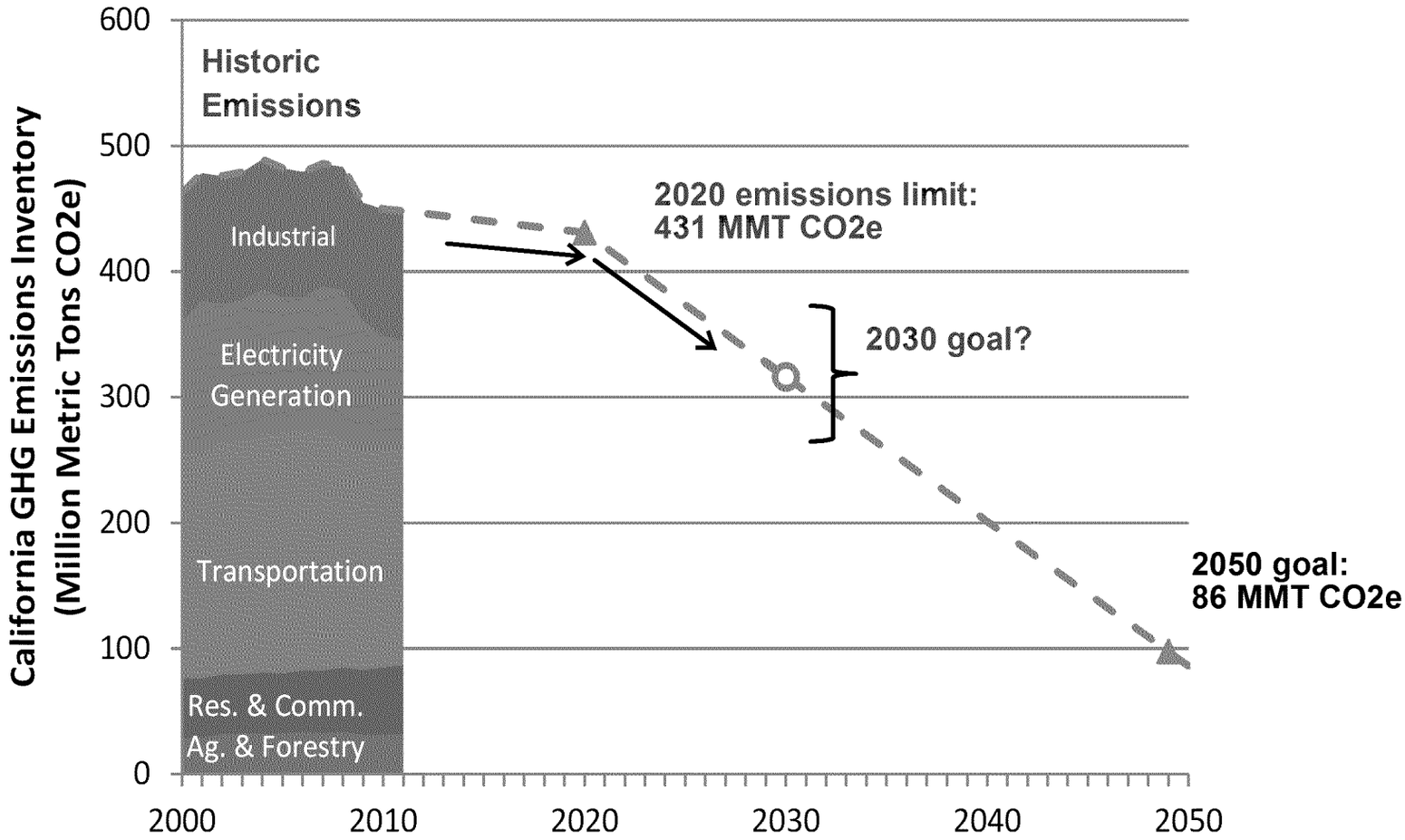
- A 2009 CPUC report estimated that: "In 2020, the total statewide electricity expenditures of the 33% RPS Reference Case is projected to be … 10.2% higher compared to the all-gas scenario." *

Integration:

- "Over-generation is the most significant operational challenge to overcome… in a 50% RPS scenario, there would be excess power for 23% of the hours annually…" **
- [Hawaii's] "PUC said it is increasingly concerned with reliability and curtailments, especially operational challenges confronting the Oahu and Kauai island grids due to potential integration of large amounts of solar PV capacity."

Sources:
**** "33% RPS Implementation Analysis Preliminary Results: Executive Summary," prepared by the California Public Utilities Commission, June 2009; page 7.***
***** E3's report titled "Investigating a Higher Renewables Portfolio Standard in California"***
****** News item from SNL by Jeff Stanfield titled "Hawaii PUC rejects utility resource plans as 'fundamentally flawed' " - April 30, 2014***

What's Next: Path to 2050 GHG Reductions



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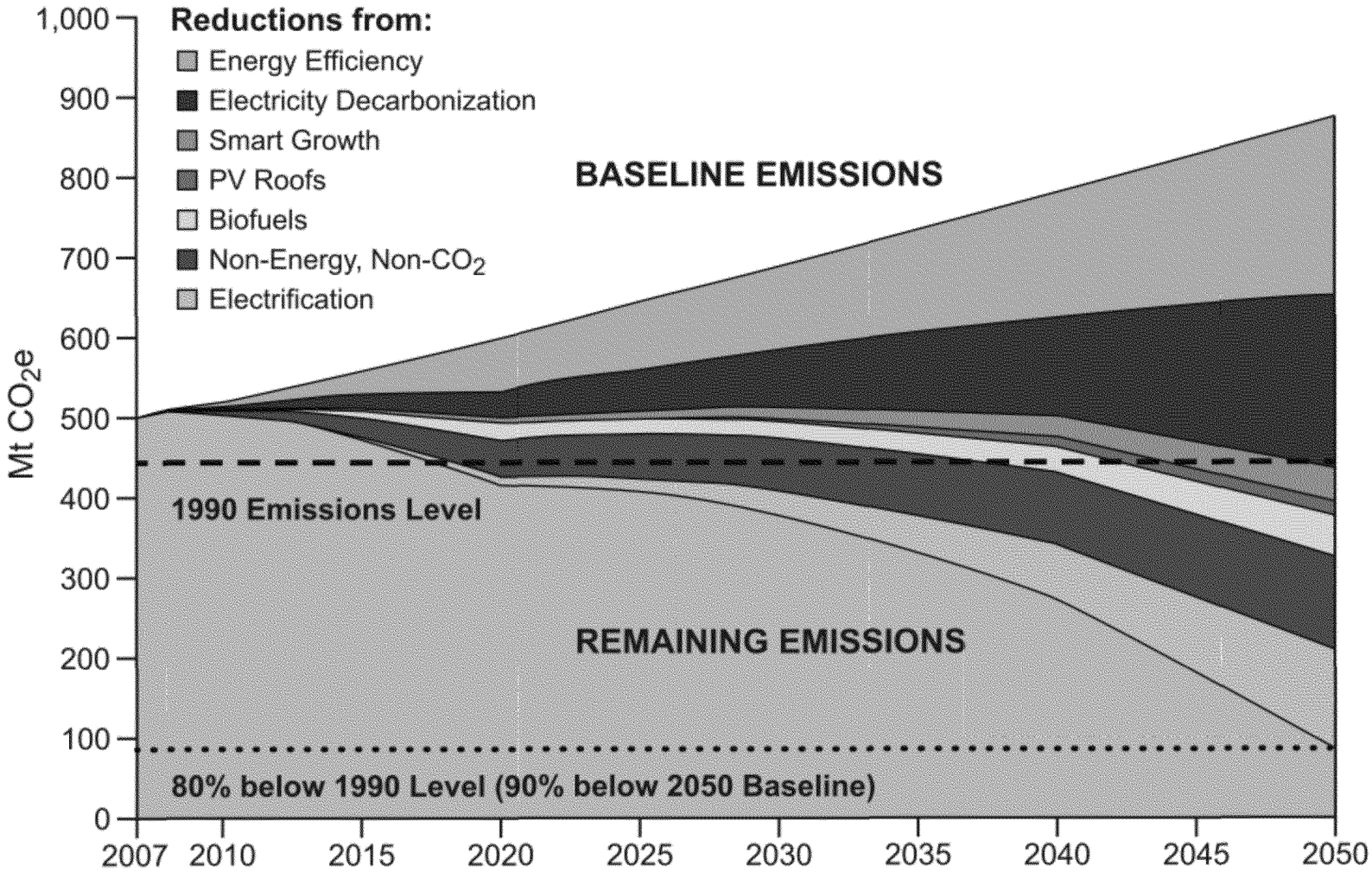
One Option to Achieve CA's 2050 GHG Goal



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Source: The Technology Path to Deep Greenhouse Gas Emissions Cuts by 2050: The Pivotal Role of Electricity *http://www.ethree.com/publications/index_2010.php*

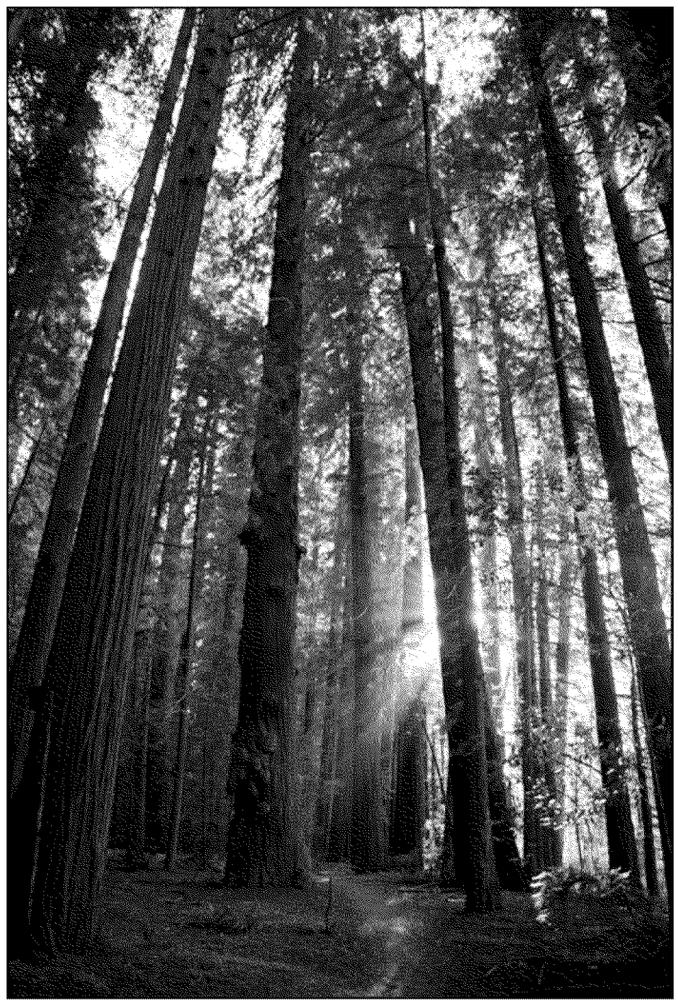
What's Next? Federal Regulation of GHG Emissions

Section 111(d) directs EPA to provide states with guidelines for determining a new performance standard for existing sources of air pollution:

- PG&E's current position:
  - Differentiated standards for states or fossil-fuel types may be appropriate in the near term; in the long term, EPA should move towards a single standard nationwide
  - Standard should be expressed in both a rate-based (e.g., lbs/MWh) and mass-based form (e.g., tons) to allow states flexibility in demonstrating equivalency through their programs
  - States should be given flexibility on how to meet the standard (e.g., using cap-and-trade program, increasing renewables or energy efficiency)

Conclusions

- Energy efficiency and renewables have been major contributors to achieving current GHG-reduction goals
- California is investigating the appropriate role of renewables in meeting further GHG reductions
- Additional focus and efforts are needed to reduce transportation and industrial sector emissions – the electricity sector can help!
- Integration solutions are needed to support California's increasing renewable mix



Questions?