



SAVING THE PLANET ONE LANDFILL AT A TIME

CHALLENGES & OPPORTUNITIES OF BIOMETHANE FOR PIPELINE INJECTION IN CALIFORNIA

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Powering forward. Together.





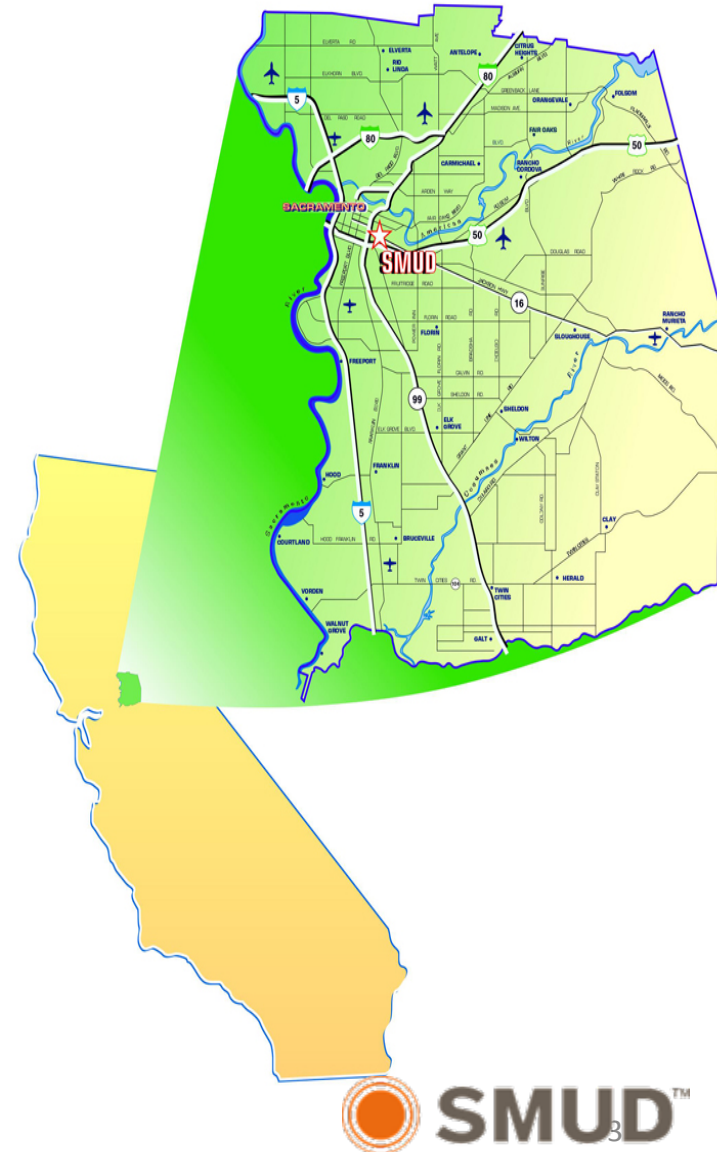
www.smud.org

Overview:

- SMUD
- Benefits
- Challenges
- Overcoming Challenges
- SMUD's Renewable Energy Mix
- Strategic Approach
- Opportunities
- Summary

SMUD – Owned By Customers

- Not for Profit, Publicly Owned Utility
- Sacramento County (small part of Placer County)
- Almost 600,000 Customers; 1.4 Million Population
- 6th Largest in U.S.
- 7 Member Board of Directors
 - Elected by Ratepayers
- Not a Part of City or County
- Manage Balancing Authority in Northern California (BANC)
- Low Rates, Innovative & Green!



Benefits of Biomethane

- Unlike wind and solar, generation from biomethane is not intermittent and can be dispatched to fill-in the gaps and promote system reliability.
- Reduces GHG emissions by displacing natural gas and reducing release of methane to the atmosphere.
- Increases productive development and use of renewable resources from organic wastes.
- Biomethane from renewable sources like dairy digesters and landfills can be a reliable source of renewable fuel that can power the cleanest and most efficient electricity generation facilities in the California.
- Biomethane flexibility of use because of transportation and storage capabilities,
- The opportunity to use a low cost renewable fuel (biomethane) when firing combined cycle generators thus producing renewable electrons at highest efficiencies, and
- Biogas has very low carbon footprint, rated as the lowest carbon producing fuel through the CEC's proceedings for the Low Carbon Fuel Standard.
- Creates local jobs by keeping local power plants operating and keeping electricity costs lower, which helps local businesses to prosper and add jobs.
- Requires no new expensive transmission or other grid infrastructure.
- Pipeline biomethane utilizes existing natural gas pipelines and the most efficient generation resources, thus preserving valuable transmission capacity for the delivery of wind and solar energy and optimizing public investments.

Biogas - Challenges

Why isn't development occurring as expected despite of benefits?

Institutional (biggest reason)

- State environmental policies and program are fragmented & sometimes conflicting. Need for coordination among various local and state agencies
- Arduous & complex permitting process
- Limited public awareness of the benefits of biomass
- Jurisdictional concerns – waste ownerships, disposals, no win-win
- Lack of stable long term economic and financial incentives
- Lack of uniform biomethane quality standard and pipeline interconnectionsolutions
- Regulatory hurdles for pipeline injection of landfill gas in California
- The regulatory hurdles relating to landfill gas injection were imposed by Assembly Bill 4037 (Hayden, Chapter 932, Statutes of 1988), but the implementation is through CPUC regulations.
 - Pipeline injection of biomethane from landfills is currently prohibited in California even if the gas is treated to meet health and safety standards. The statute effectively precludes landfill gas from being introduced into the pipeline from in-state sources. Currently, excess landfill gas must be flared, and some estimate that as much as 50 percent of the total amount of methane captured at landfills across the state is flared The statute added Section 25421(a) to the California Health and Safety Code, which states that “no gas producer shall knowingly sell, supply, or transport landfill gas to a gas corporation, and no gas corporation shall knowingly purchase landfill gas, if that gas contains vinyl chloride in a concentration that exceeds the operative no significant risk level set forth in Article 7 (commencing with Section 12701) of Chapter 3 of Division 2 of Title 22 of the California Code of Regulations.”

Biogas - Challenges

Why isn't development occurring as expected despite of benefits?

Economics

- Costs of biogas/biomethane generation systems (including cleaning and pipeline interconnection using biomass sources such as dairy wastes, food wastes, and other organic wastes) are high in comparison with traditional forms of electricity generation.
- Cost of biomass wastes (and other feedstock for co-digestion) including transportation cost of these feedstocks are high
- Sustainable supply of feedstocks; securing and reliability of long term supply
- The recent economic downturn made financing of biomethane projects more difficult.
- For dairies, the price of milk is low that makes farmers not to invest and install digesters.
- Competition with vested utility, biomass fuels **or sources, biomethane as transportation fuels**, and waste management infrastructures. **There is a need to perform trade off-study for electricity and transportation fuels applications.**
- Cost to interconnect small biogas projects is high to natural gas pipeline

Biogas - Challenges

Why isn't development occurring as expected despite of benefits?

Technical

- Anaerobic Digestion technologies and biomethane clean-up technologies remain to be fully demonstrated and commercialized
- Lack of performance data for biomethane technologies such as co-digestion of other feedstocks for digesters (including dairy waste and food wastes which improve the cost-effectiveness of digesters and co-digestion at wastewater treatment plants) and need for sustainable feedstock sourcing
- Investment in research, development, and demonstration (RD&D) is insufficient to help resolve the challenges related to next generation biogas conversion technologies (e.g., biomass-to-biomethane or renewable NG conversion technologies).
- Lack of data for co-digestion
- Sustainable feedstock sourcing and transportation issues
- Lack of performance data for new technologies (biomass gasification and producer gas cleaning for pipeline quality gas) and costs

Biogas - Challenges

Why isn't development occurring as expected despite of benefits?

Environmental

- Environmental benefits are not internalized
- Remaining issues with air quality (NO_x) and water quality
- Lack of environmental data for new technologies
- Public health – odor, flies
- Hayden law – prohibits landfill gas injection in State

Overcoming Challenges



SMUD™

Biogas Interest / Drivers

- **GHG regulations**
 - ✓ Reshaping energy supply
 - ✓ Prompting biogas development
 - ✓ Climate change
- **RPS-driven biogas energy additions**
 - ✓ Pipeline injection
 - ✓ Local biogas development
- **Other Environmental Concerns**
 - ✓ Health and Safety Issues
 - ✓ Odors & Flies
 - ✓ Emissions from disposal practices (NO_x, H₂S, etc)
- **Loss of Energy Resources**
 - ✓ Electricity and heat
 - ✓ Transportation fuels

SMUD Board Policy

A sustainable power supply is defined as one that 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.

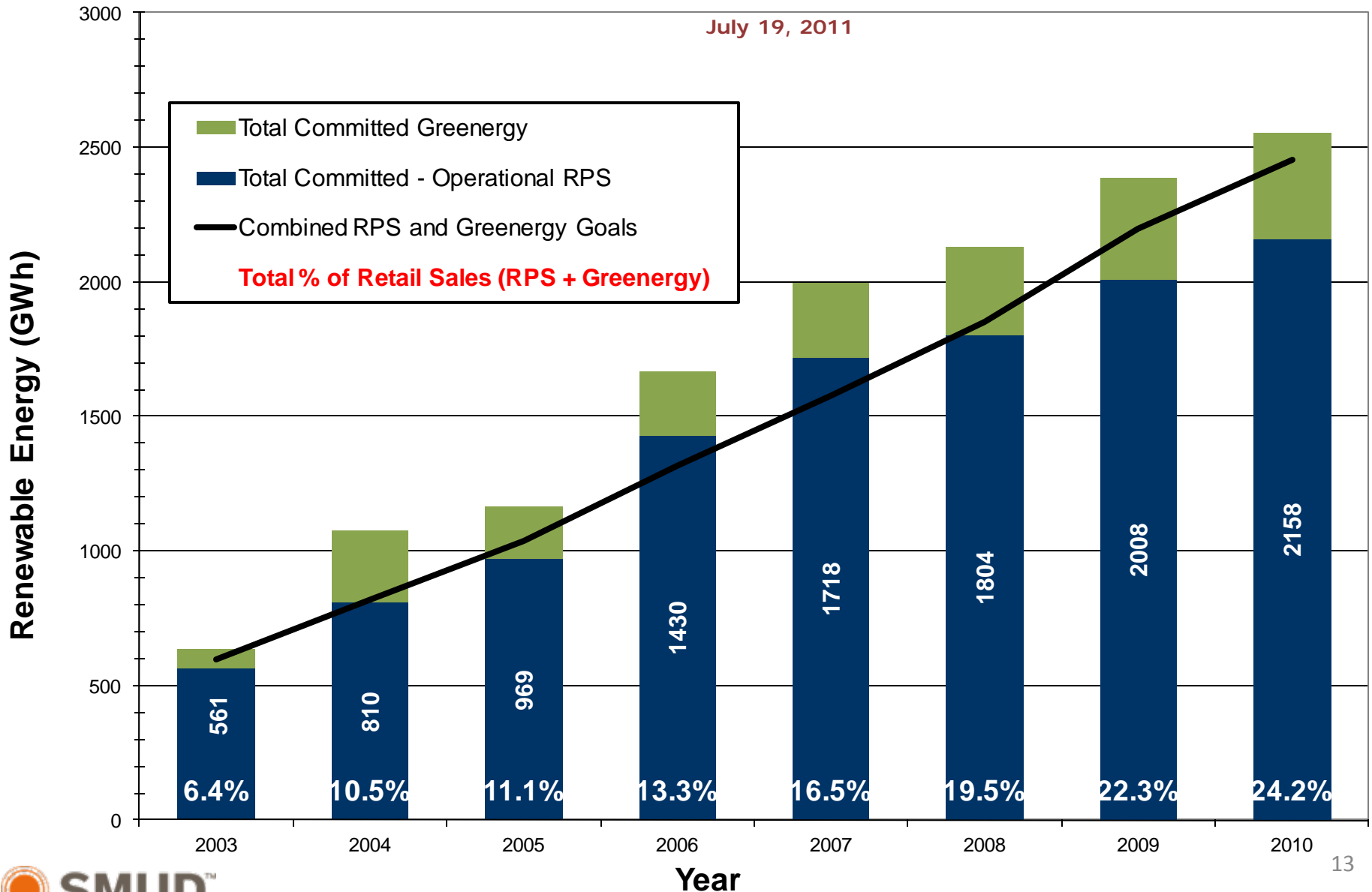
Renewables Goals

- Aggressive renewable energy goals

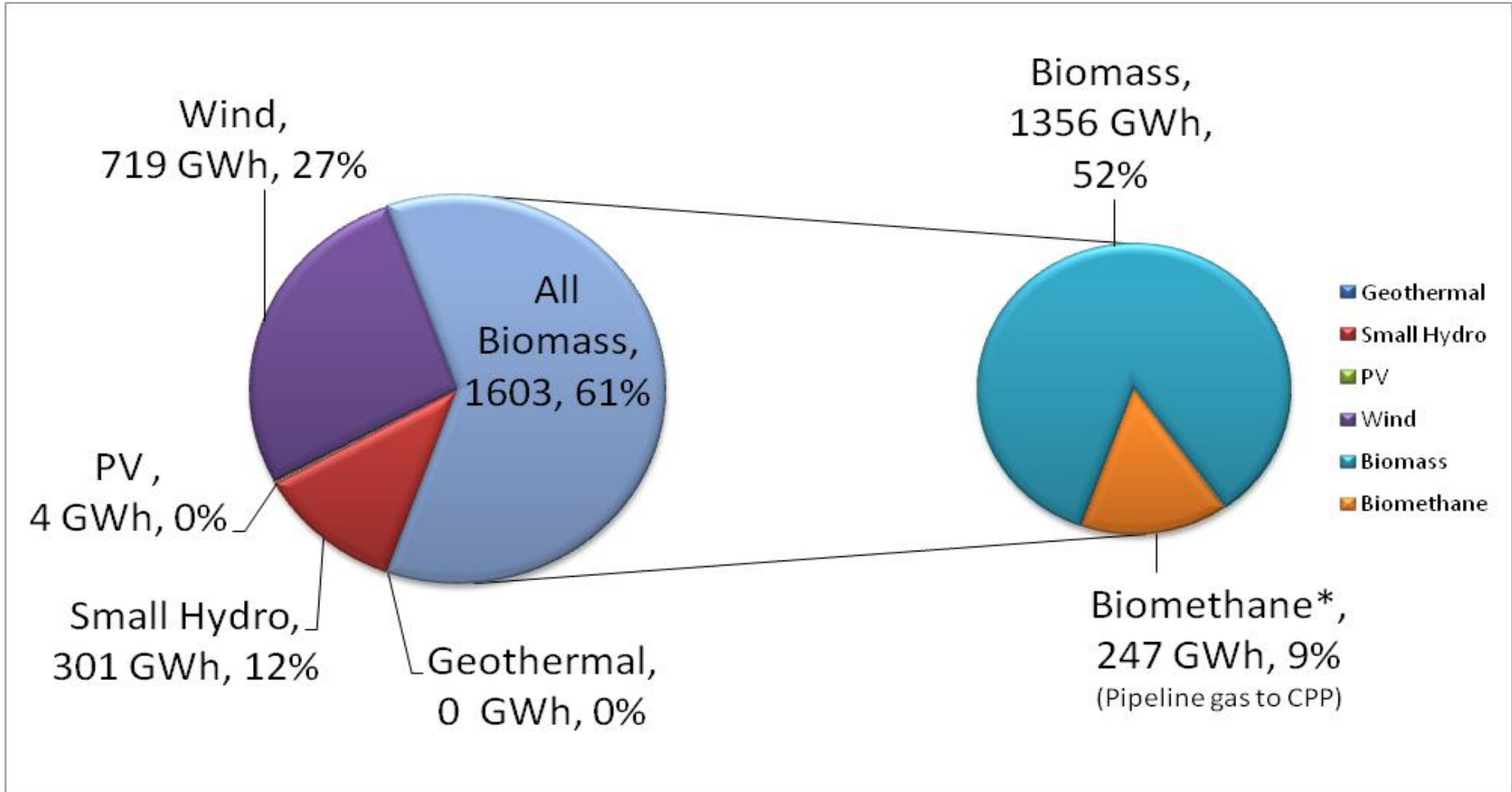
Renewable Energy Program	2009 Actual	2010 Goal	2010 Actual	2020 Goal
RPS	18.8%	20%	20.4%	33%
Greenergy	3.5%	3.8%	3.8%	4%
Total	22.3%	23.8%	24.2%	37%

SMUD's Renewable Energy Growth 2003-2010

July 19, 2011



SMUD's RENEWABLE ENERGY MIX 2010

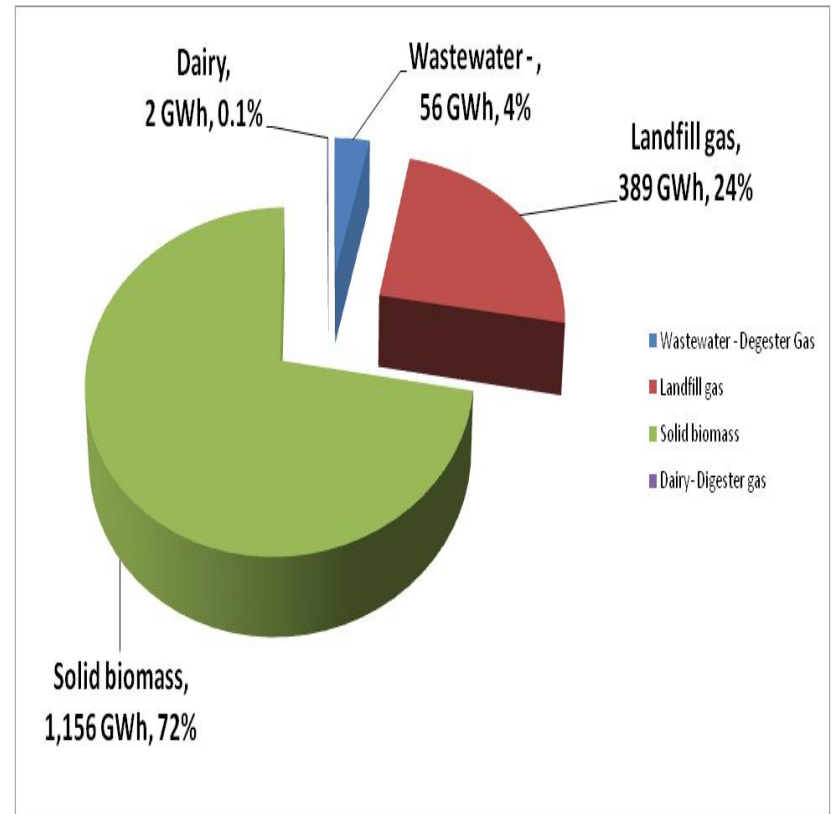


2010 Total GWh ~ 11,000 for all sources

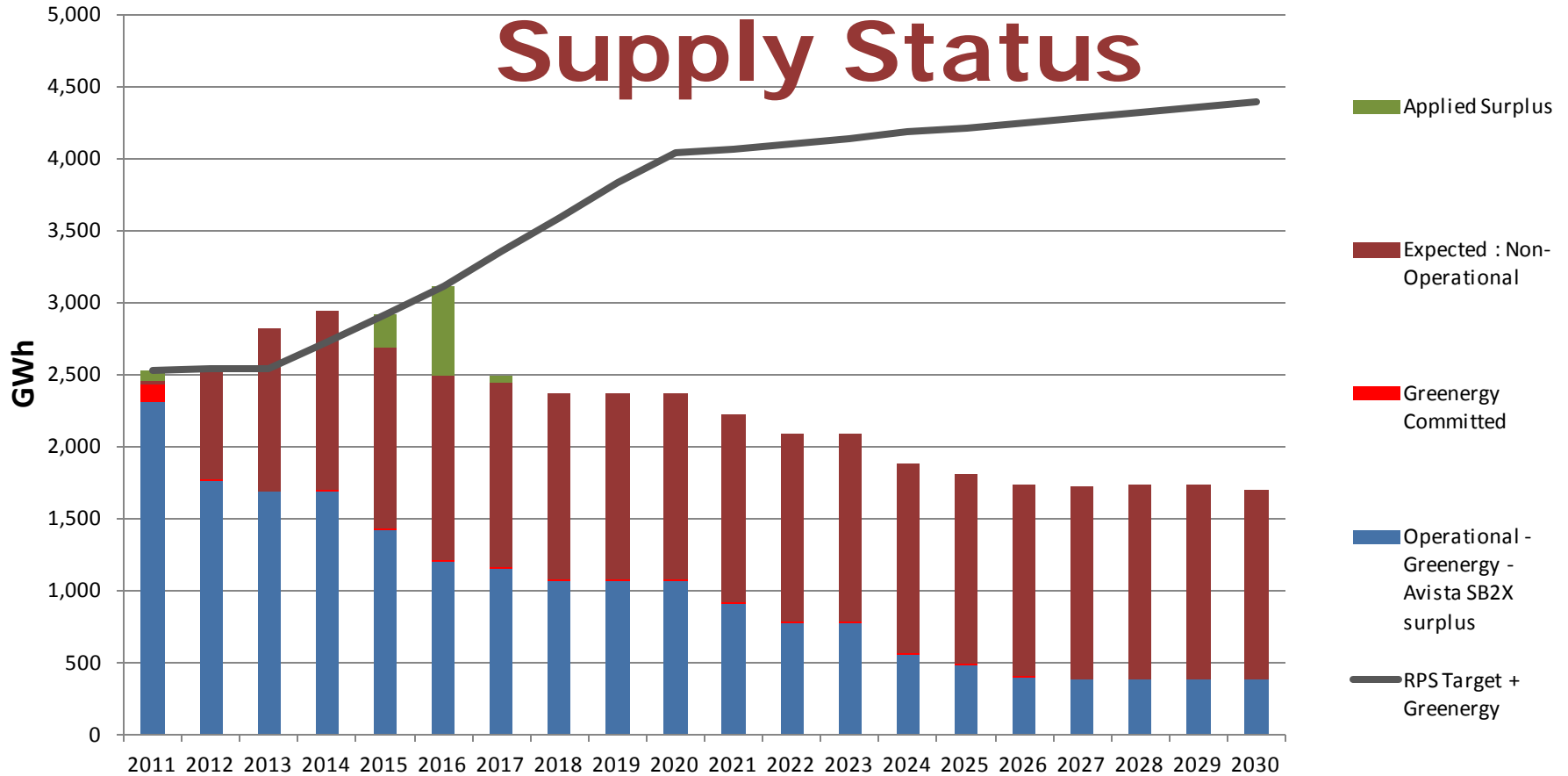
SMUD's Biopower Today

Technology/ Fuel Source	Number of facilities *	GWh
Solid Fuel Combustion	4	1,156
Biogas -Landfill gas-to-energy	3	389
Biogas - Wastewater treatment	1	56
Biogas -Dairy digester	2	2
Totals	10	1,603

* In and outside of SMUD Region



Renewables Targets and Supply Status



Goals and Annual Compliance

Biogas Sources



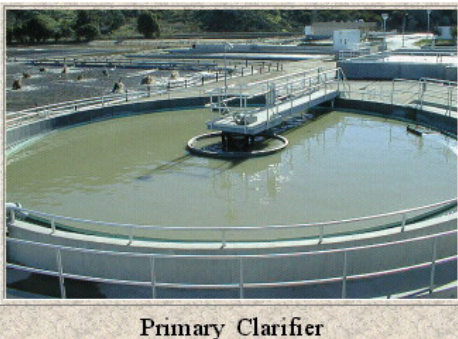
*From
landfills*



*From Food
Wastes*



*From
livestock
operations*



Primary Clarifier

*From
wastewater
treatment
plants*



*Biomass
gasification -
Methanation*

Biogas Opportunities in the Western US

(Resource Potentials)

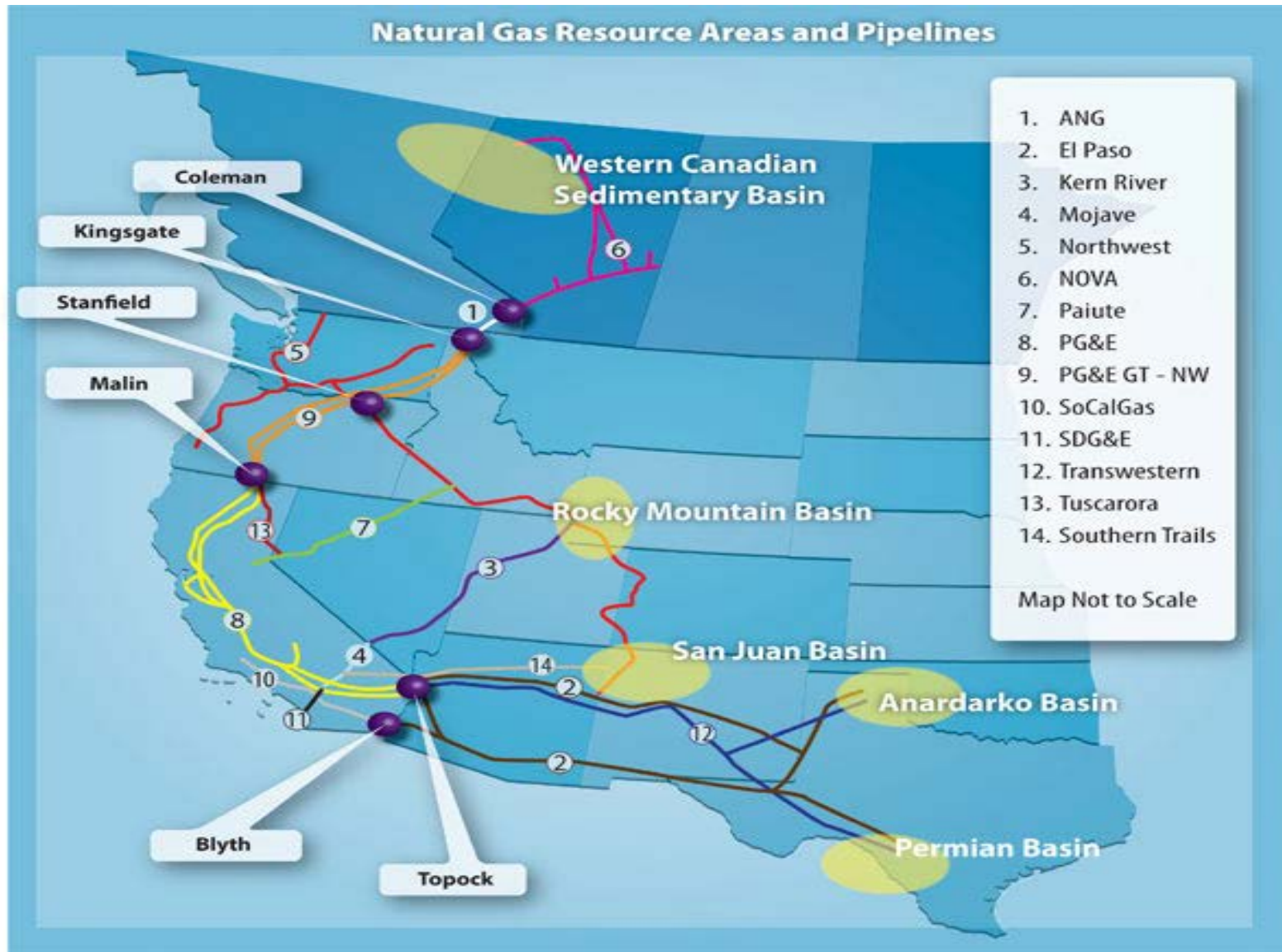
	California	Other 12 Western States	Total
	Gross MW*	Gross MW*	Gross MW*
Wastewater Treatment Plants	210	351	561
Landfills	1300	990	2,290
Dairy Manure Digesters	470	566	1,036
TOTAL	1,980	1,907	3,887

* All analysis assumes a heat rate of 6900 BTU/kWh for conversion of biogas to power

Source: B&V & SMUD 2010, A case of biogas for Pipeline Injection
(excluding food wastes, FOG, and other organic wastes for co-digestion or stand-alone AD)



Common Carrier of Gas Pipelines in CA



ACQUIRING RENEWABLE ENERGY

1. Power Purchase Agreements

- Request for Offers
- Unsolicited Proposals

2. SMUD Owned & Operated

- Innovative Ownership Options

3. Private (Customer) Owned

- Net Metering

4. Private (IPP) Owned

- Feed-In Tariff (FIT) began 1/1/2010- already oversubscribed
- Design, build, own & operate

5. RD&D Innovations



Summary

- GHG/RPS goals/regulation driving SMUD to more renewables
- Biomethane for pipeline injection has more opportunities to be realized despite challenges

Thank You

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