

California's Dairy Power Production Program

*AgSTAR National Conference
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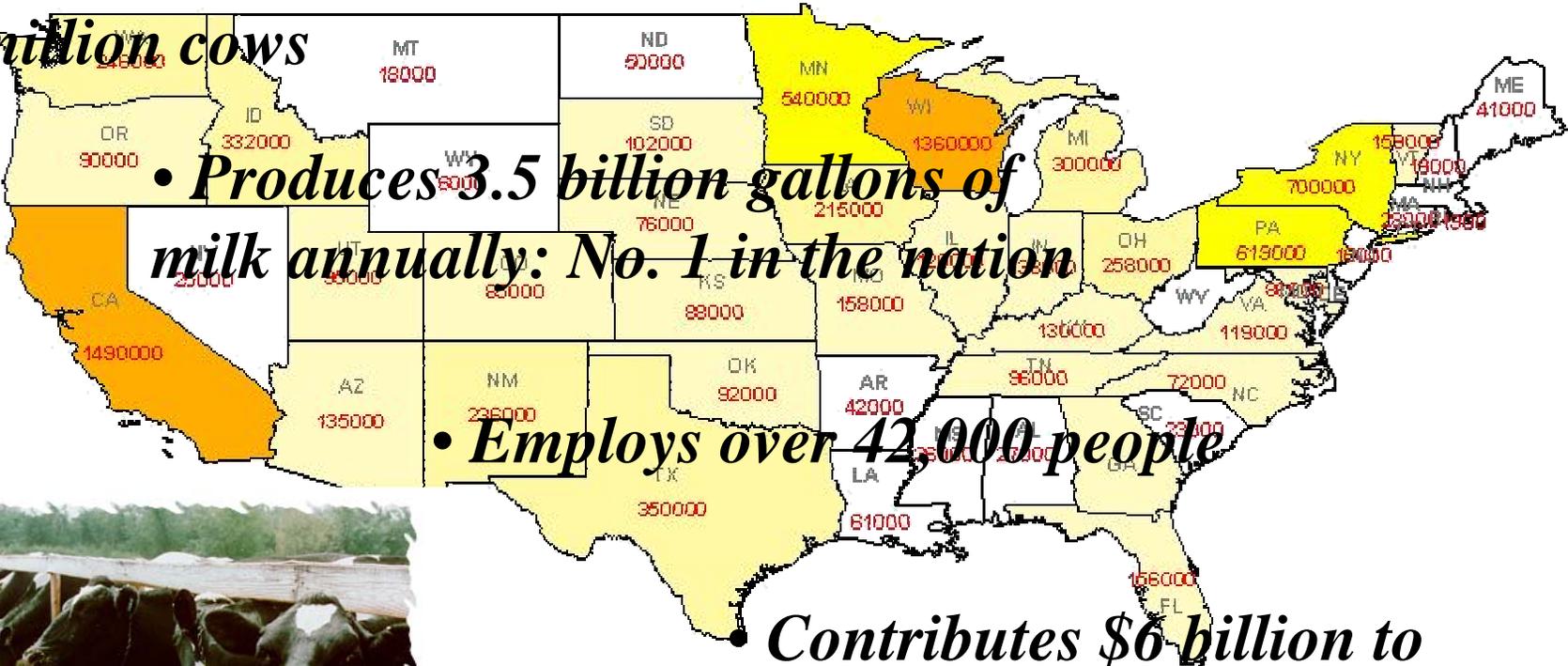
*California Energy Commission
George Simons
Manager, PIER Renewables*



WESTERN UNITED RESOURCE DEVELOPMENT, INC.

CA's Dairy Industry

- Is home to over 2220 dairies and 1.5 million cows



- Produces 3.5 billion gallons of milk annually: No. 1 in the nation

- Employs over 42,000 people

- Contributes \$6 billion to California's economy



California Situation Circa 2001

◆ *Low Milk Prices*

- *Dropping; by 2003 were the lowest in 25 years*
- *Influencing capital investment and growth decisions*

◆ *Consolidation Within the Industry*

- *Continuing shift to larger herds, fewer dairies*
- *Increasing pressure to reduce capital expenditures; take less risk*

◆ *Environment*

- *Increasing concerns over odor, vector control, water quality and air quality*
- *Moratorium in Chino Basin*

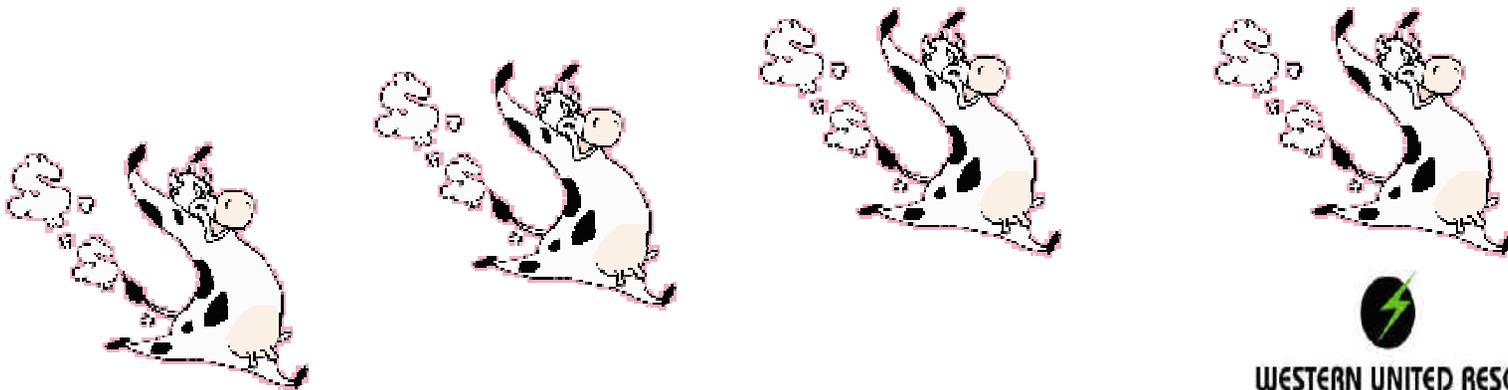
◆ *Energy*

- *Record number of outages; high price volatility*



Legislative Response: Dairy Power Production Program (DPPP)

- ◆ *Established from SB5X (Sher, 2001)*
 - *Legislation addressing peak electricity demand problems in California*
 - *\$709 million of energy efficiency actions*
 - *\$10 million directed to "encourage the development of manure methane power production projects on California dairies."*
- "Money from Methane"*



DPPP Goals and Objectives

- ◆ *Selected Projects Representative of Industry and Have Strategic Value*
- ◆ *Address Peak Electricity Issues*
 - *Offset need for dairies to buy electricity during peak*
 - *Reduce threat of outages*
- ◆ *Demonstrate Viability of Dairy Biogas Energy*
 - *Commercially available and reliable*
 - *Cost-effective*
- ◆ *Environmental Benefits*
 - *Reduce groundwater contamination issues*
 - *Eliminate methane emissions*



Program Framework

◆ *Energy Commission*

- *Policy and technical guidance*
 - ✓ *Program evaluation*
 - ✓ *Coordination with other biogas energy activities*

◆ *WURD*

- *Program Administrator*
 - ✓ *Marketing and outreach*
 - ✓ *Project due diligence and project monitoring*

◆ *Advisory Group*

- *Coordination between development, regulatory and environmental perspectives*



Project Selection

- ◆ *Applications Screened by CEC/WURD/Advisory Group*
 - *Criteria include:*
 - ✓ *Technical feasibility*
 - ✓ *Track record of developer*
 - ✓ *Commitment of dairy*
 - ✓ *Economics*
 - ✓ *Permitting*
- ◆ *Two Funding Pathways*
 - *Buydown*
 - ✓ *Covers 50% of costs up to \$2000/kW; requires technical and financial due diligence*
 - *Incentive Payments*
 - ✓ *Pays for generated electricity at \$0.057/kwhr; requires financial due diligence; more risk for dairy*



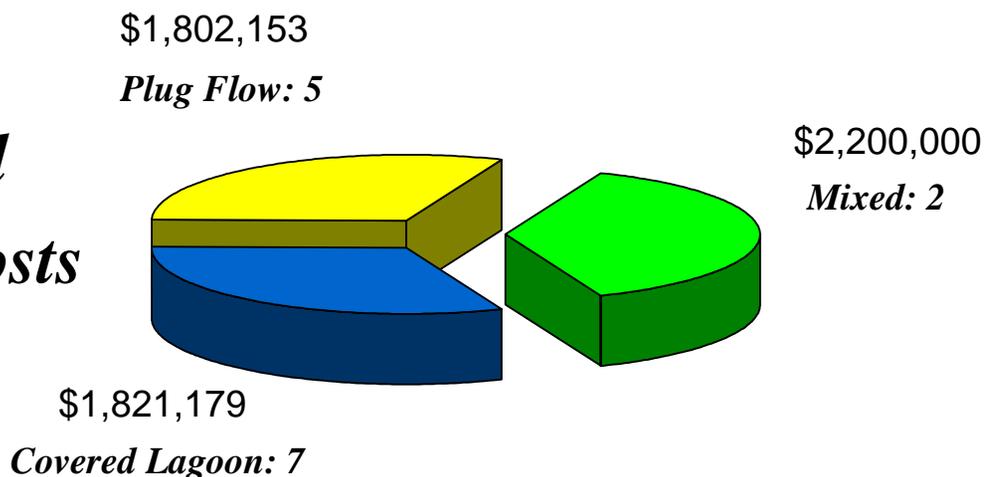
Overall Program Status

◆ Application Process Completed

- Over 55 applications representing in excess of \$56 million and requesting over \$15 million in funding
- Good coverage of CA dairies

◆ 14 Awarded Projects

- \$5.8 million awarded
- \$13.8 million total costs



Project Snapshots & Status

Project	Digester Type	Herd Size	Capacity (kW)	Project Cost (\$\$)	Cost (\$/kW)	% Complete
201-B	Cov'd lagoon	1050	120	\$362,000	\$3,017	?
202-B	Cov'd lagoon	6000	250	\$1,500,000	\$6,000	60%
204-B	Cov'd lagoon	5081	300	\$1,289,520	\$4,298	65%
207-B	Cov'd lagoon	237	75	\$135,800	\$1,811	95%
221-B	Cov'd lagoon	1600	160	\$772,925	\$4,831	90%
225-I	Plug flow	1500	260	\$381,850	\$1,469	98%
226-B	Plug flow	600	130	\$489,284	\$3,764	10%
230-B	Plug flow	1900	160	\$524,898	\$3,281	90%
232-I	Cov'd lagoon	175	30	\$75,000	\$2,500	100%
238-B	Cov'd lagoon	1258	150	\$229,557	\$1,530	40%
234-I	Mixed	1100	100	\$582,000	\$5,820	?
248-I	Plug flow	1500	563	\$1,546,350	\$2,747	?
249-B	Plug flow	770	150	\$661,923	\$4,413	?
250-B	Mod.Plug flow	7200	1000	\$4,565,000	\$4,565	?



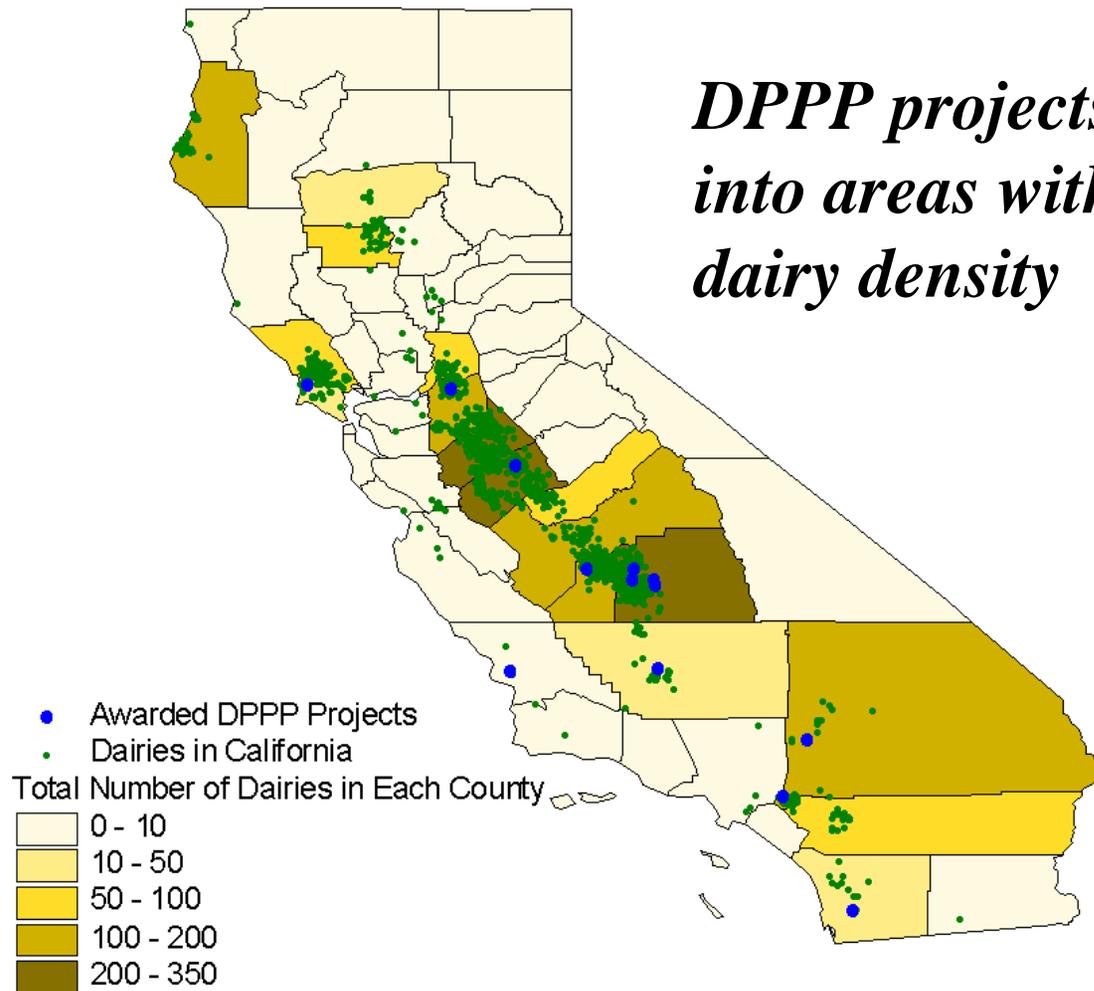
Program Profile

- ◆ *Geographic Distribution*
- ◆ *Dairy Sizes (Herd)*
- ◆ *Manure Management*
- ◆ *Types of Digesters*
- ◆ *Range of Project Costs*

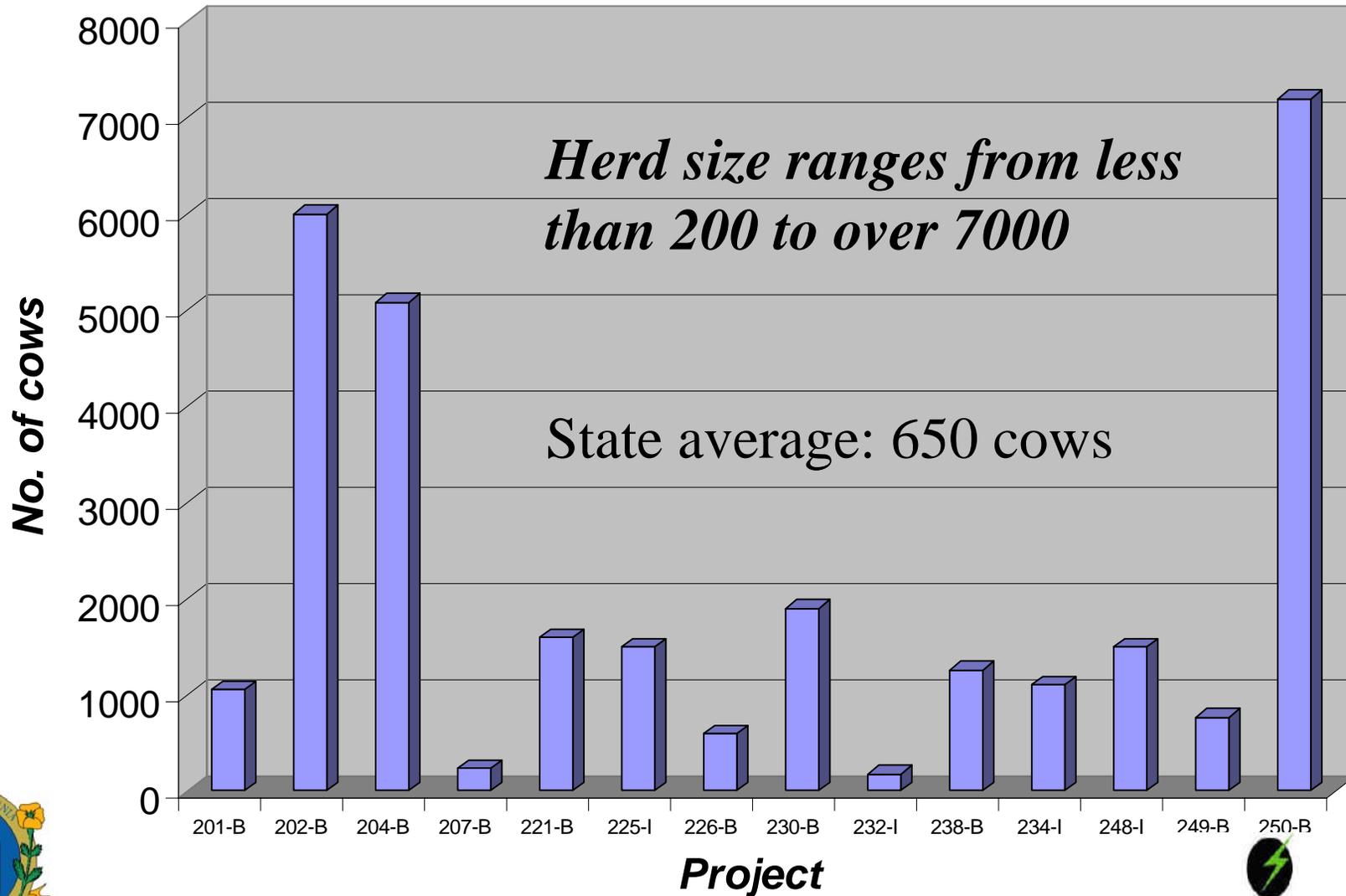


Projects Relative to CA Dairy Distribution

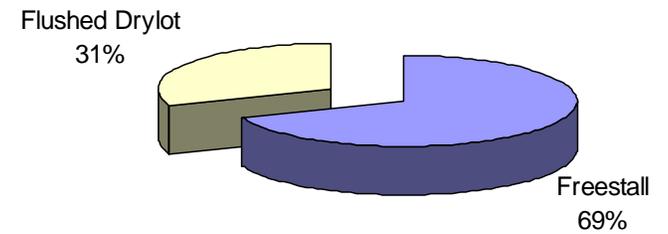
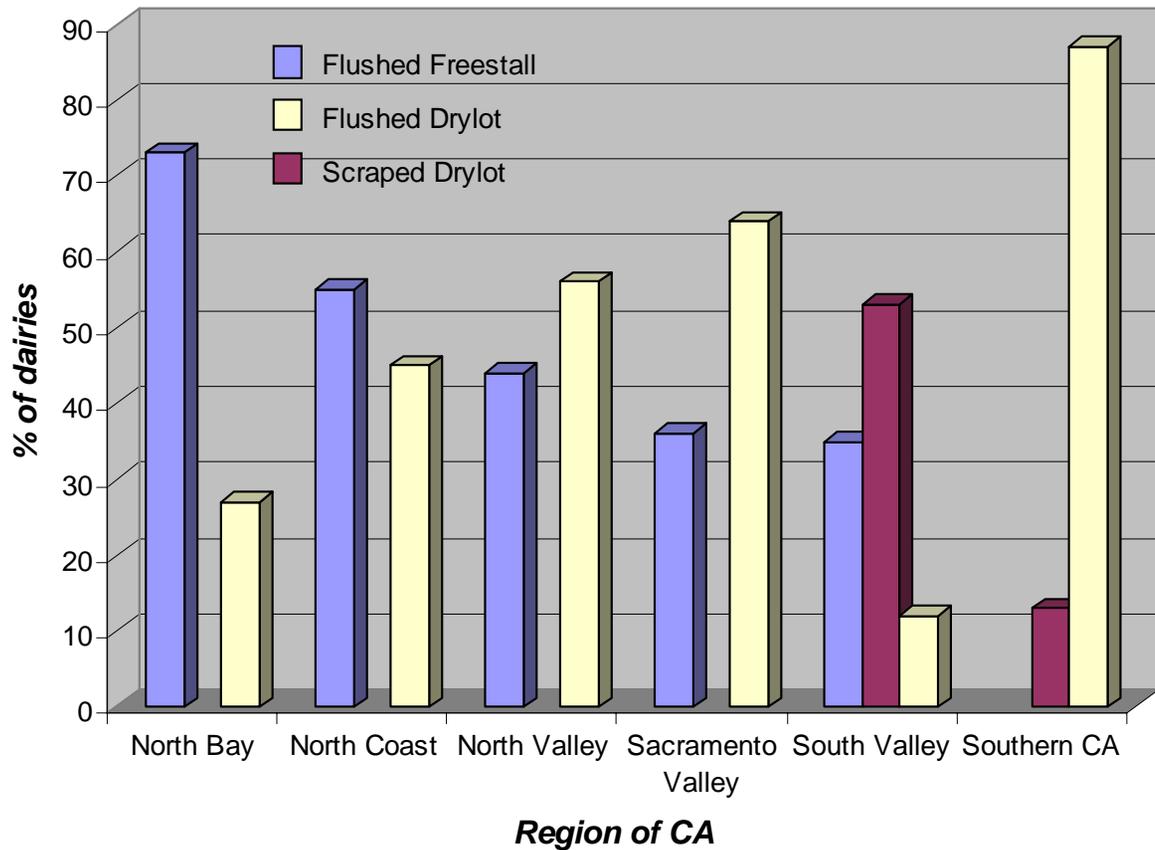
DPPP projects fall into areas with high dairy density



Herd Sizes



Manure Management Practices



Manure management practices are representative of the overall industry

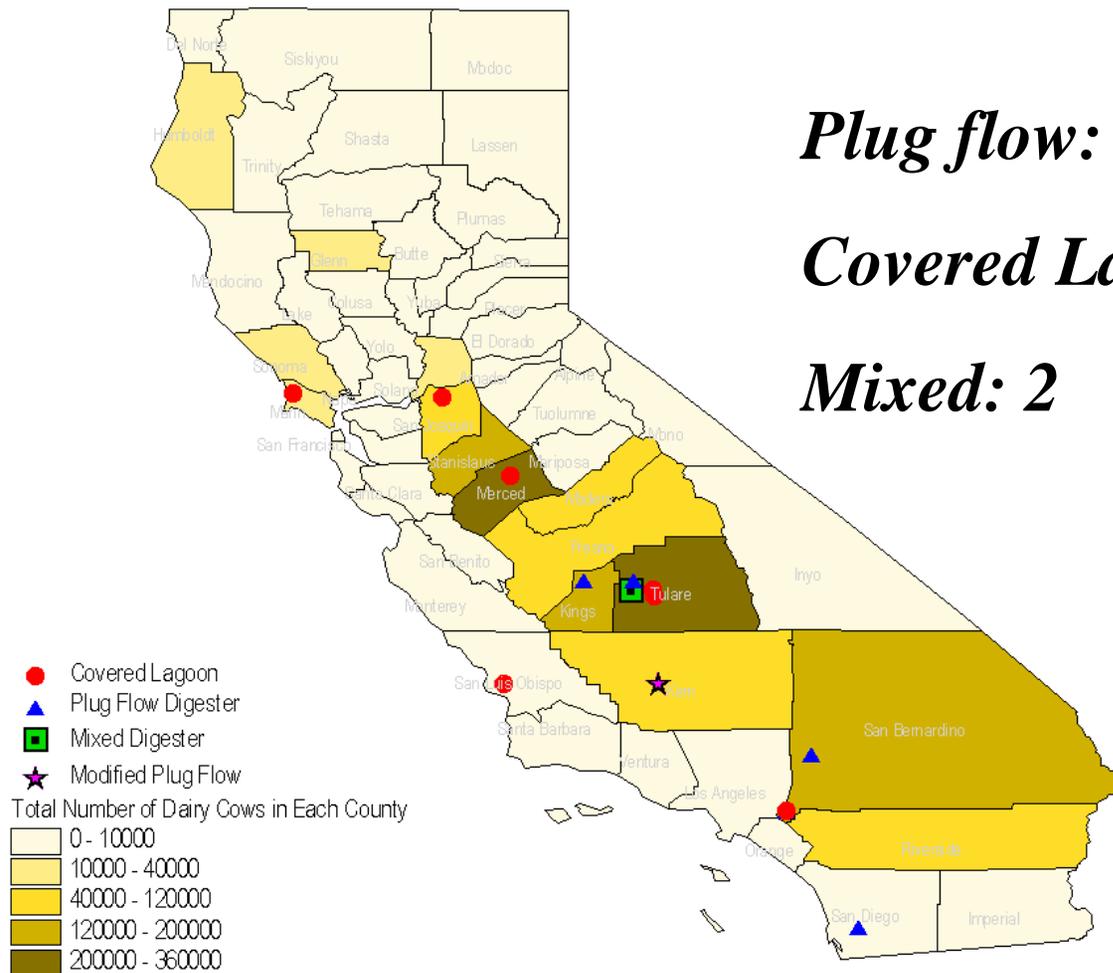


Distribution of Digester Types

Plug flow: 5

Covered Lagoon: 7

Mixed: 2



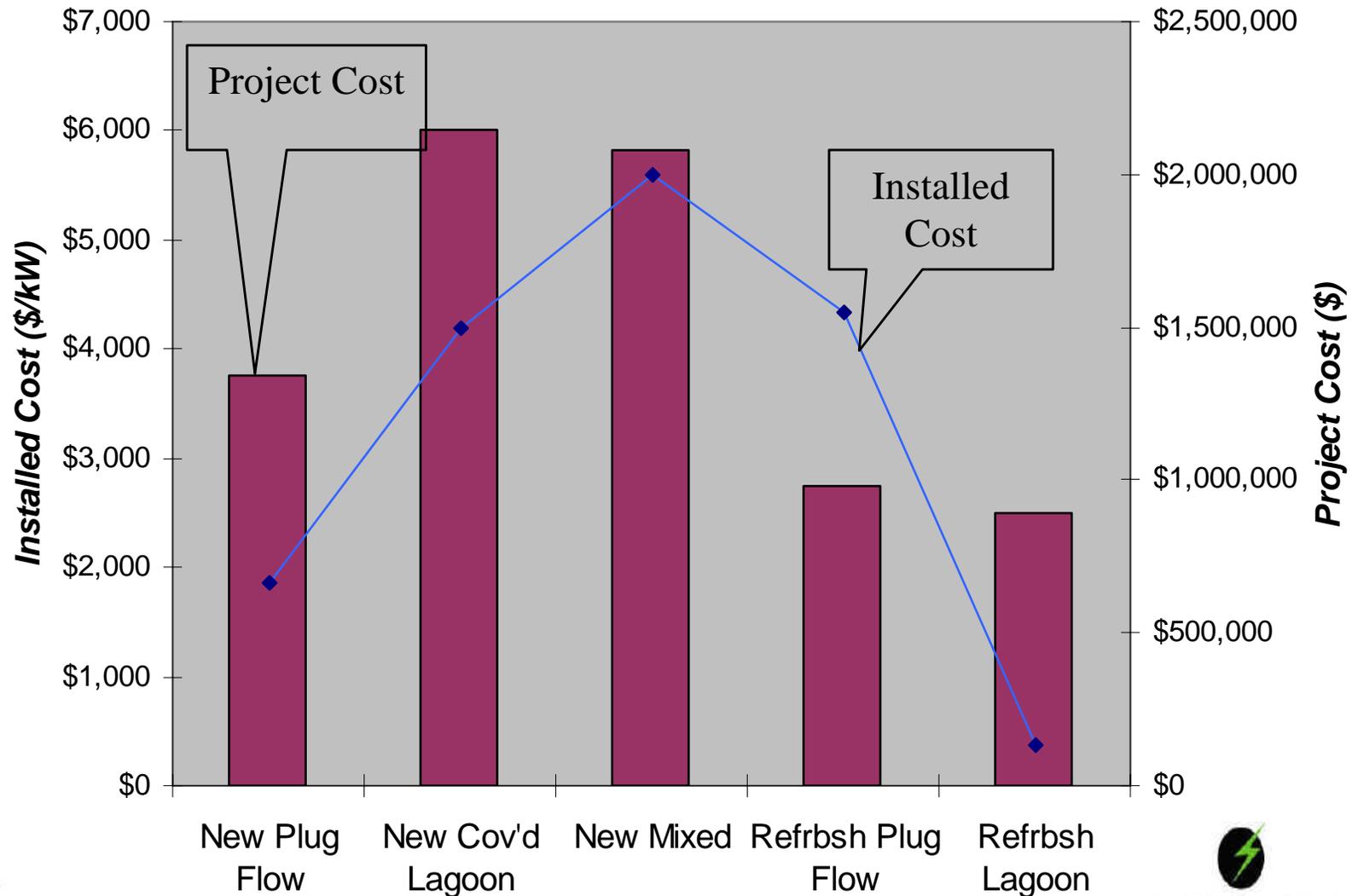
- Covered Lagoon
- ▲ Plug Flow Digester
- Mixed Digester
- ★ Modified Plug Flow

Total Number of Dairy Cows in Each County

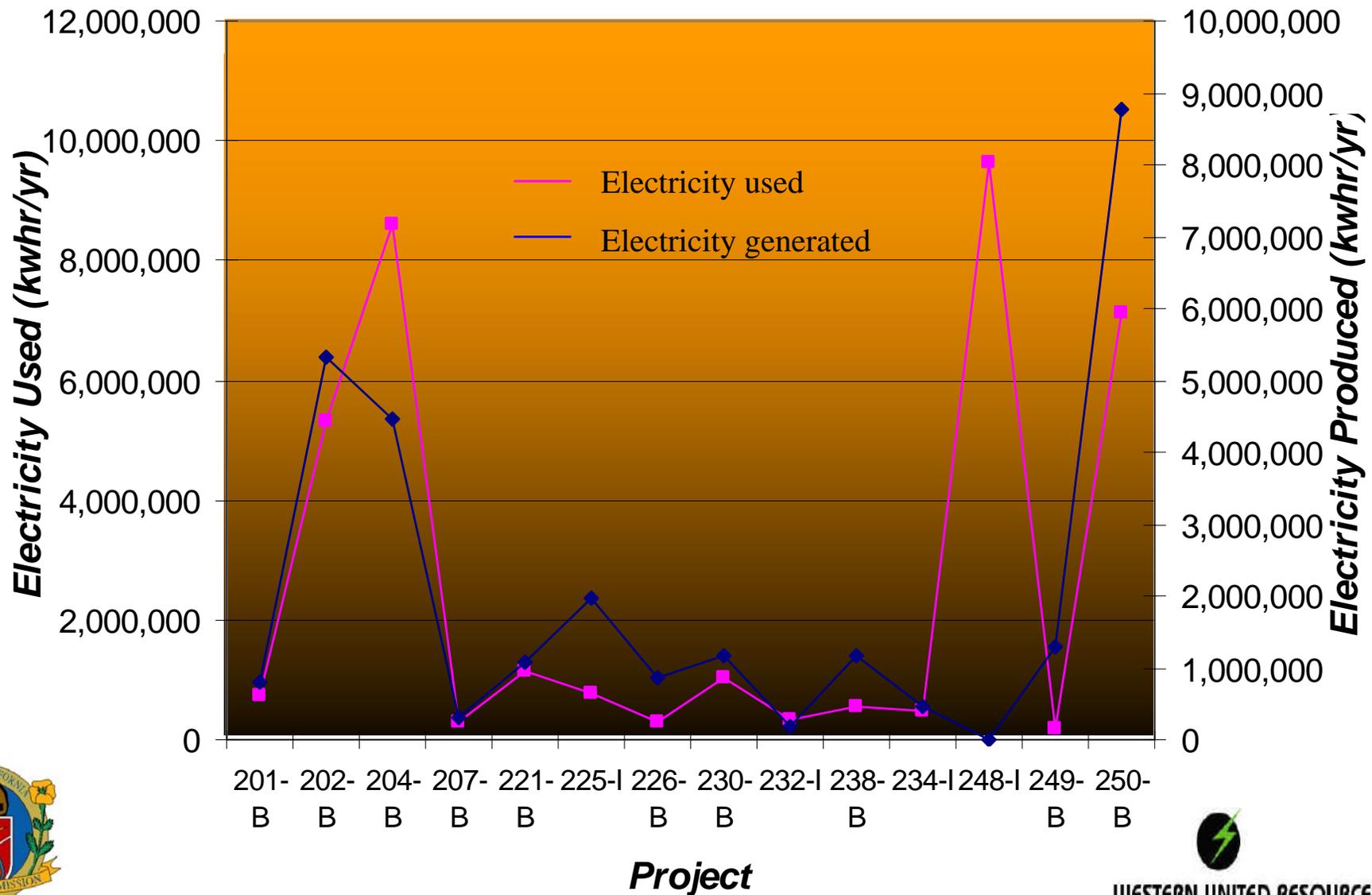
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10000 - 40000
40000 - 120000
120000 - 200000
200000 - 360000



Project and Installed Costs



Addressing Electricity Needs

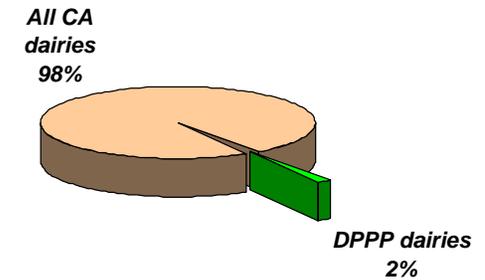
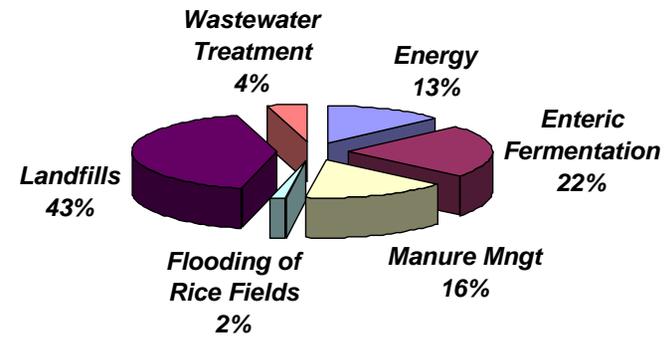
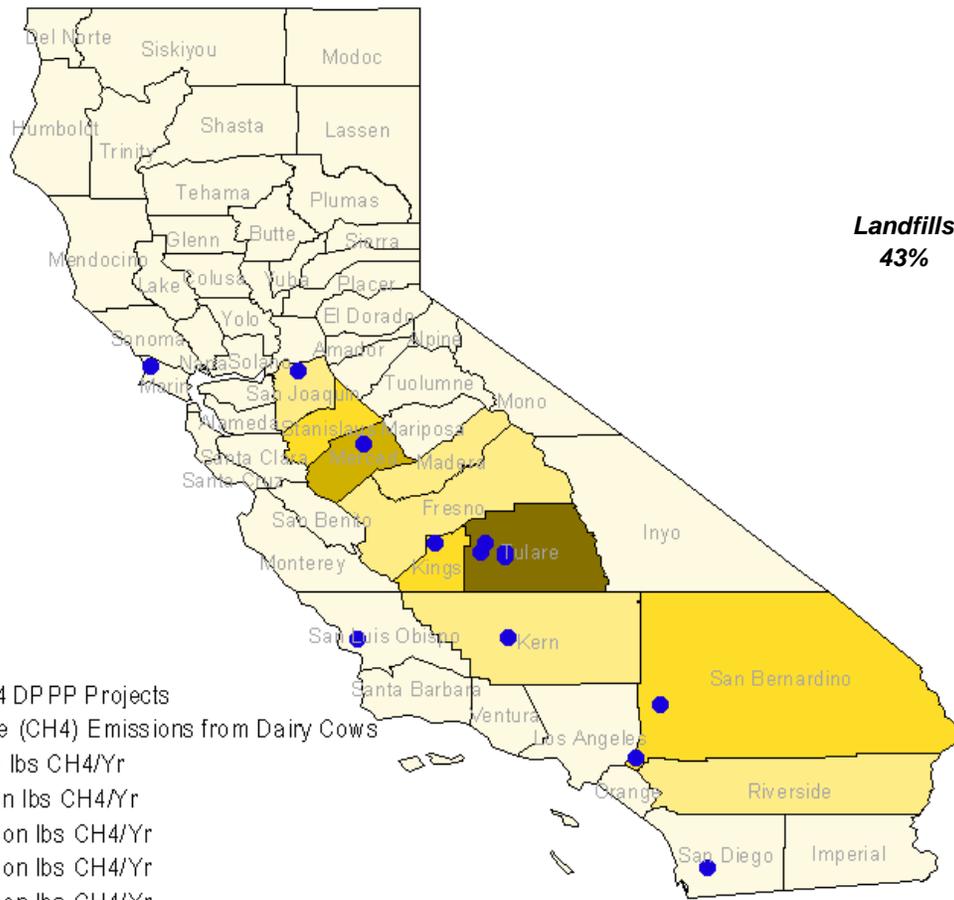


Demonstrating Viability of Dairy Biogas

- ◆ *All projects using only commercially available equipment*
 - *Mostly covered lagoon or plug flow systems*
 - *Reciprocating engines*
- ◆ *Requiring installers with proven track record*
- ◆ *Project payback typically less than 6 years*
 - *Dependent on displacement of retail rate electricity*
 - *Less than 3 years with grant*



Environmental Benefits: Methane Reductions



Project 207: Refurbished 75 kW Covered Lagoon



- 237 cows: 75 kW
- Project costs: \$135,800
- 4 year payback



Project 225: Refurbished 260 kW Plug Flow



- 1500 cows: 260 kW
- Project costs: \$1 million
- 7.4 year payback



Project 230: New Plug Flow Project



- 1900 cows: 260 kW
- Project costs: \$525,000
- 3.6 year payback



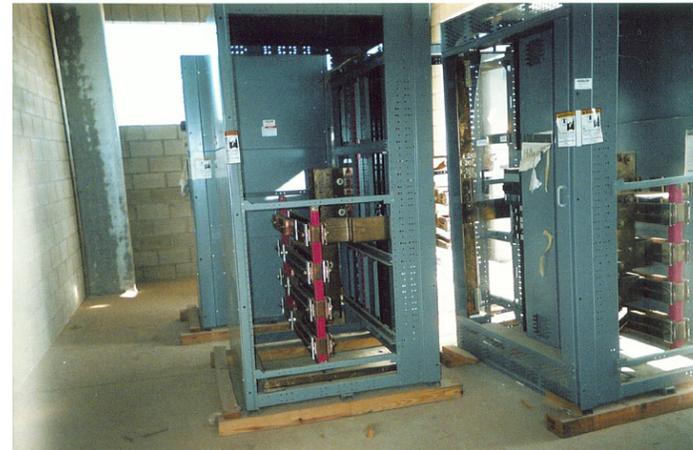
Project 232: Refurbished Covered Lagoon



- 175 cows: 30 kW
- Project costs: \$75,000
- 5 year payback



Project 202: New Covered Lagoon



- 6000 cows: 250 kW
- Project costs: \$1.5 million
- 2 year payback



Future Directions

- ◆ *Primary Focus: Expanding Applications Across California*
 - *Project Experiences*
 - *Evaluation of Economics and Environmental Benefits*
 - *Dissemination of Results*
 - *Transfer into CA RPS*
- ◆ *Centralized Digester Facilities*
 - *Counties with high dairy densities*
 - *Working with Inland Empire Utility Agency and others on template*

