



California's Existing Biopower and Progress toward Reaching the Bioenergy Executive Order S-06-06 Setting the Bar for Biopower

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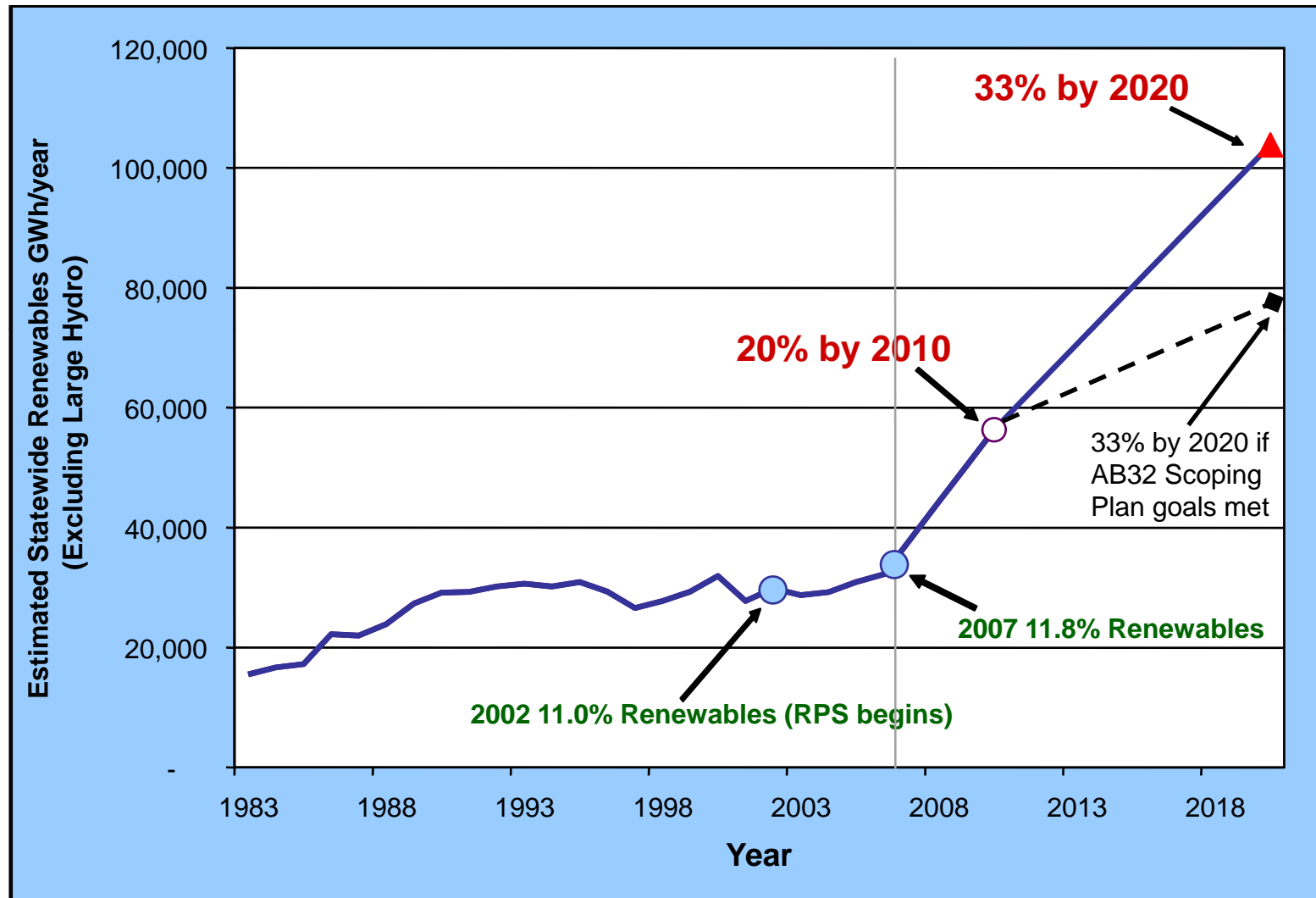
California's Renewables Portfolio Standard



- RPS signed into law in 2002 assigning roles to Energy Commission, CPUC, and requiring retail sellers to procure 20% renewable energy by 2010.
- Publicly Owned Utilities set their own RPS goals recognizing the intent of the legislature to attain a target of 20 percent of California retail sales of electricity from renewable energy by 2010.
- Executive Order S-14-08, signed November 2008, sets further goal of 33% renewable energy by 2020 and streamlines California's renewable energy project approval process.

RPS procurement compliance is measured in terms of **electricity delivered**, not signed contracts.

California's Renewable Energy Goals



20% by 2010 and 33% by 2020 goals **based on retail sales.**

2002 11% Renewables and 2007 11.8% Renewables **based on generation.**

RPS Eligible Biopower Technologies

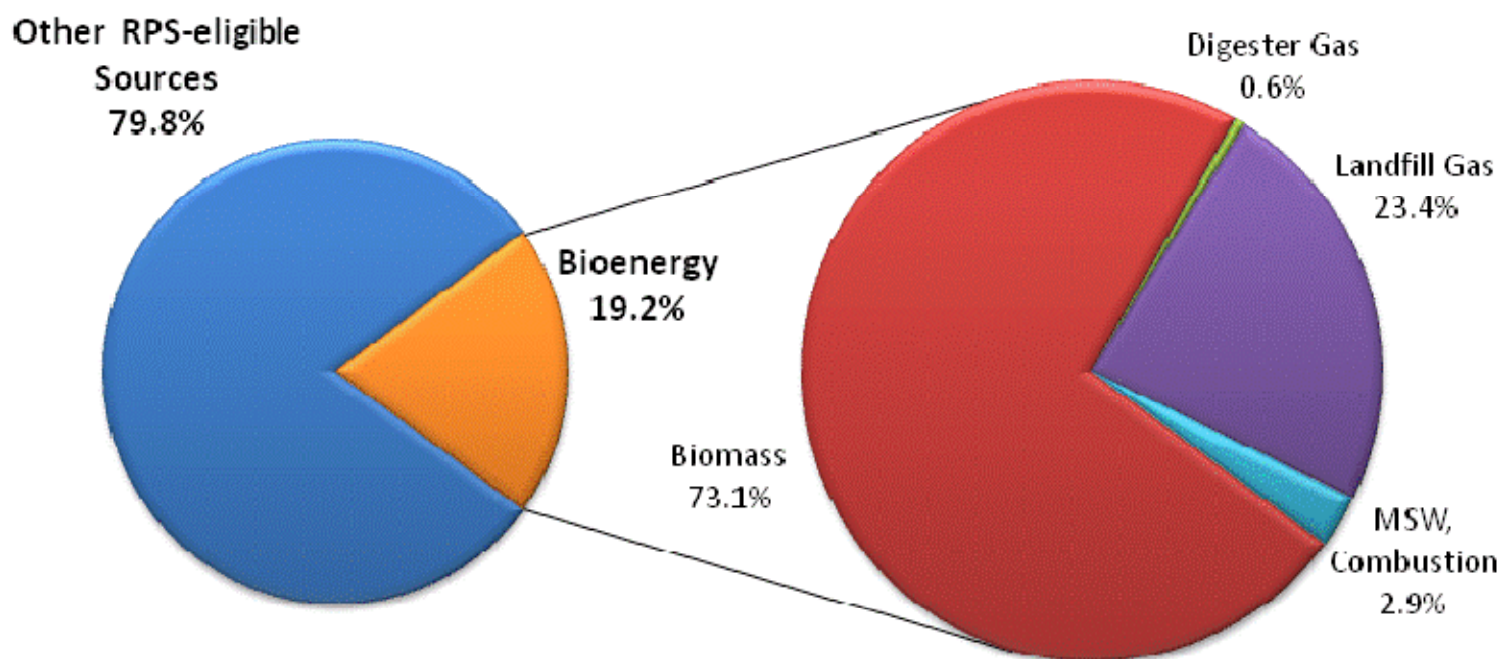


- Biodiesel
- Biomass
- Digester gas
- Fuel cells using bioenergy
- Landfill gas
- Municipal solid waste (limited)
- Combination of Technologies
 - Co-firing biomass with coal
 - STE/biopower hybrid

Existing Bioenergy Mix Claimed for RPS



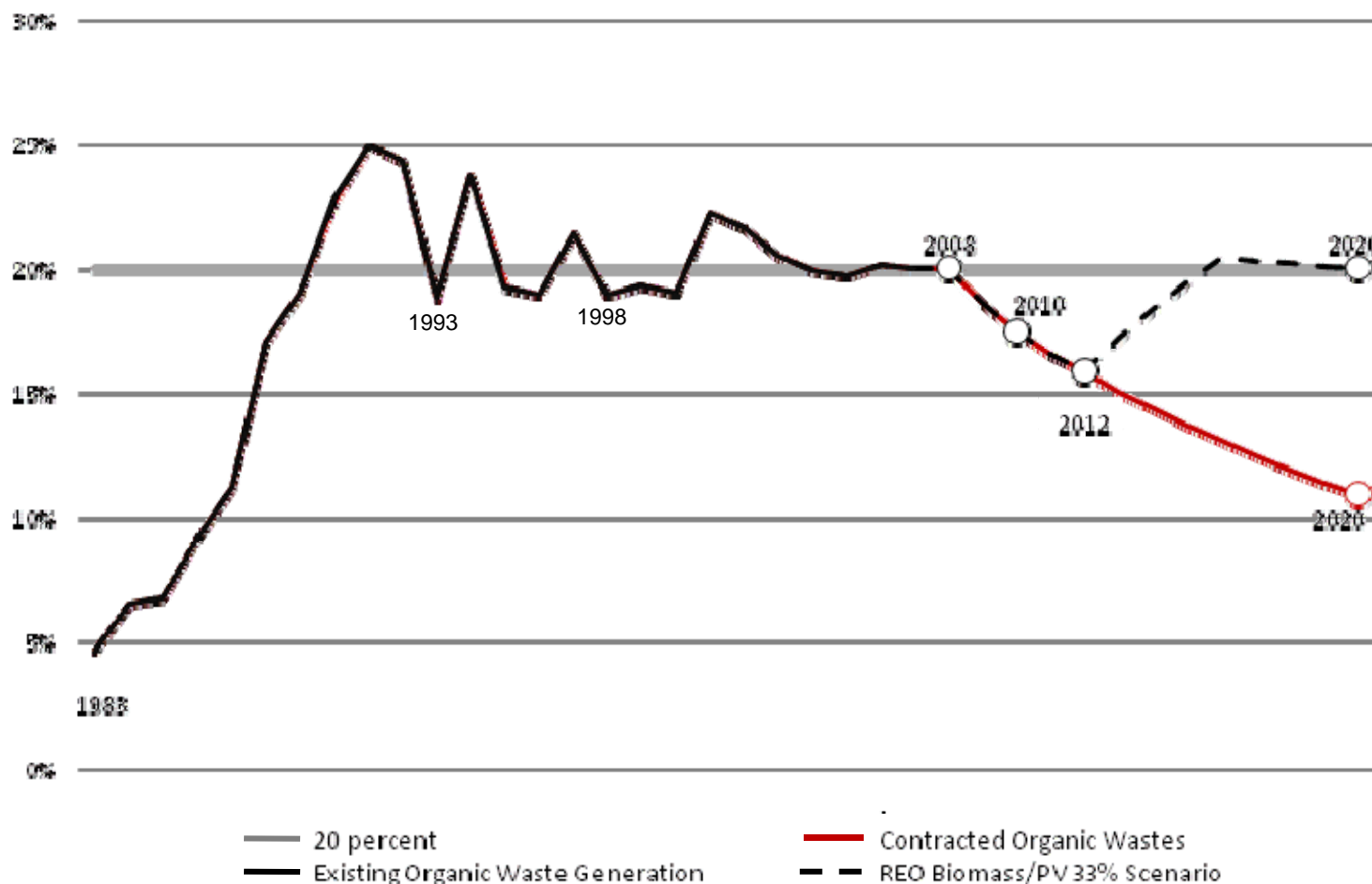
2006 California IOU and ESP Procured RPS Energy (Unverified claims)



Statewide bioenergy (in-state and imports) for 2006 is 20 percent.

Source: California Energy Commission RPS Procurement Verification Database. Data represents claims submitted to the Energy Commission as of April 10, 2009 via CEC-RPS-Track form for the purpose of verifying RPS procurement claims. Data will be summarized in the 2006 RPS Procurement Verification Report (forthcoming 2009). 1983 - 2006: California Energy Commission, ELECTRICITY_GEN_1983-2006 - Excel File, www.energyalmanac.ca.gov/electricity/. Small hydro generation estimate prepared by Energy Commission staff. 2006 Net System Power Report, <http://www.energy.ca.gov/2007publications/CEC-300-2007-007/CEC-300-2007-007.PDF>

Percent of Renewables from Bioenergy (California and Imported)



Sources:

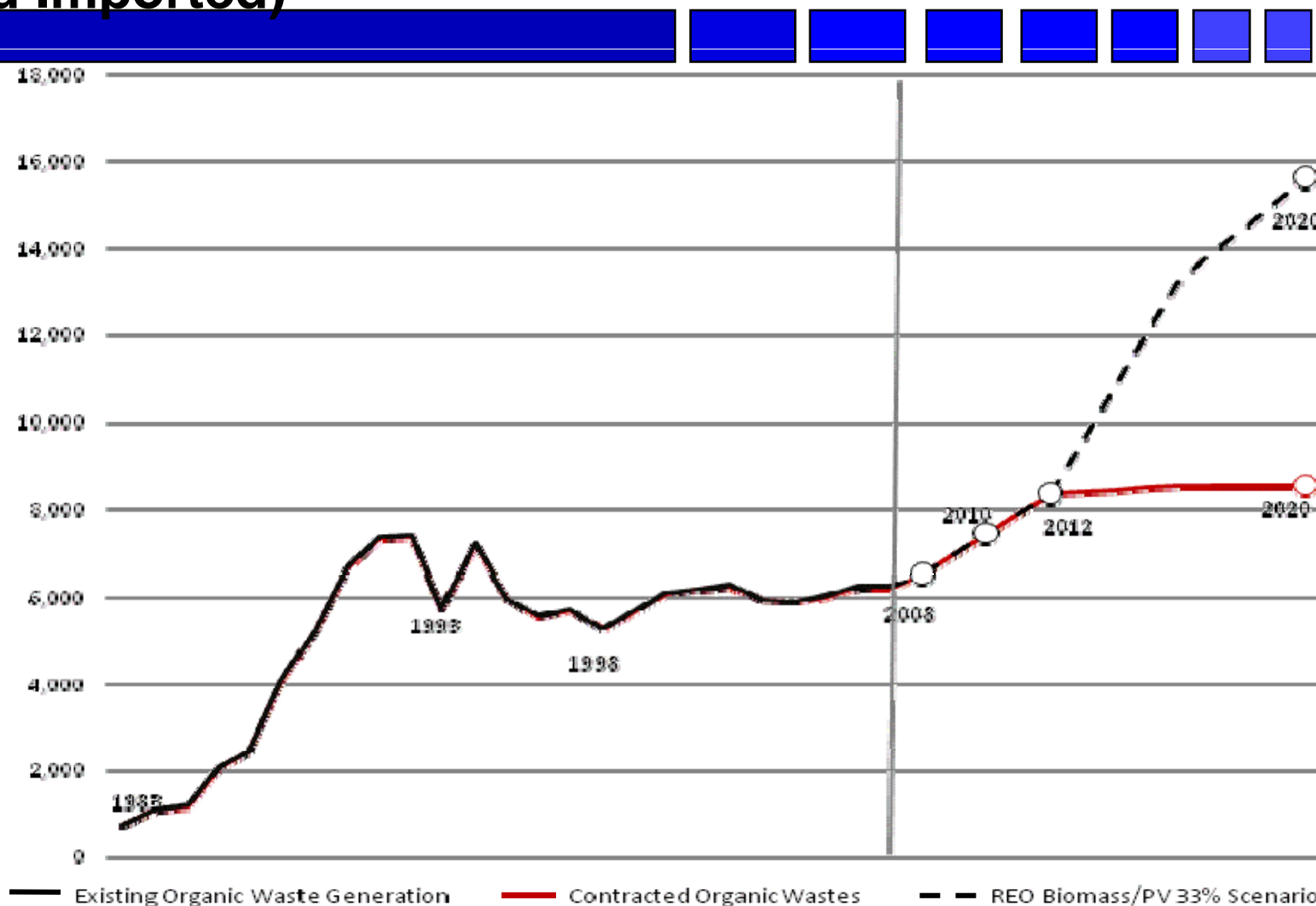
1983 - 2006: California Energy Commission, ELECTRICITY_GEN_1983-2006 - Excel File, www.energyalmanac.ca.gov/electricity/. Small hydro generation estimate prepared by Energy Commission staff. Represent generation flowing into four California control areas: CAISO, LADWP, IID, and SMUD.

2007: California Energy Commission, April 2008, 2007 Net System Power Report, CEC 200-2008-002, www.energy.ca.gov/2008publications/CEC-200-2008-002/CEC-200-2008-002-CMF.PDF. Out-of-state small hydro generation methodology for 2007 consistent with 1983-2006 claimed data.

2008 - 2020 (red line): California Energy Commission, IOU and POU RPS contract databases, www.energy.ca.gov/portfolio/index.html.

2008 - 2020 (dashed line): California Energy Commission, Renewable Energy Office biomass/PV 33% scenario prepared for 2009 IEPR.

Generation from Bioenergy (GWh/yr, California and Imported)



Sources:

1983 - 2006: California Energy Commission, ELECTRICITY_GEN_1983-2006 - Excel File, www.energyalmanac.ca.gov/electricity/. Small hydro generation estimate prepared by Energy Commission staff. Represent generation flowing into four California control areas: CAISO, LADWP, IID, and SMUD.

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Signed IOU RPS Contracts by Technology

Biomass/Biogas less than 10% of Projected Deliveries



Contracts are executed as a result of utility solicitations while others are negotiated bilaterally, separate from the RPS solicitation process.

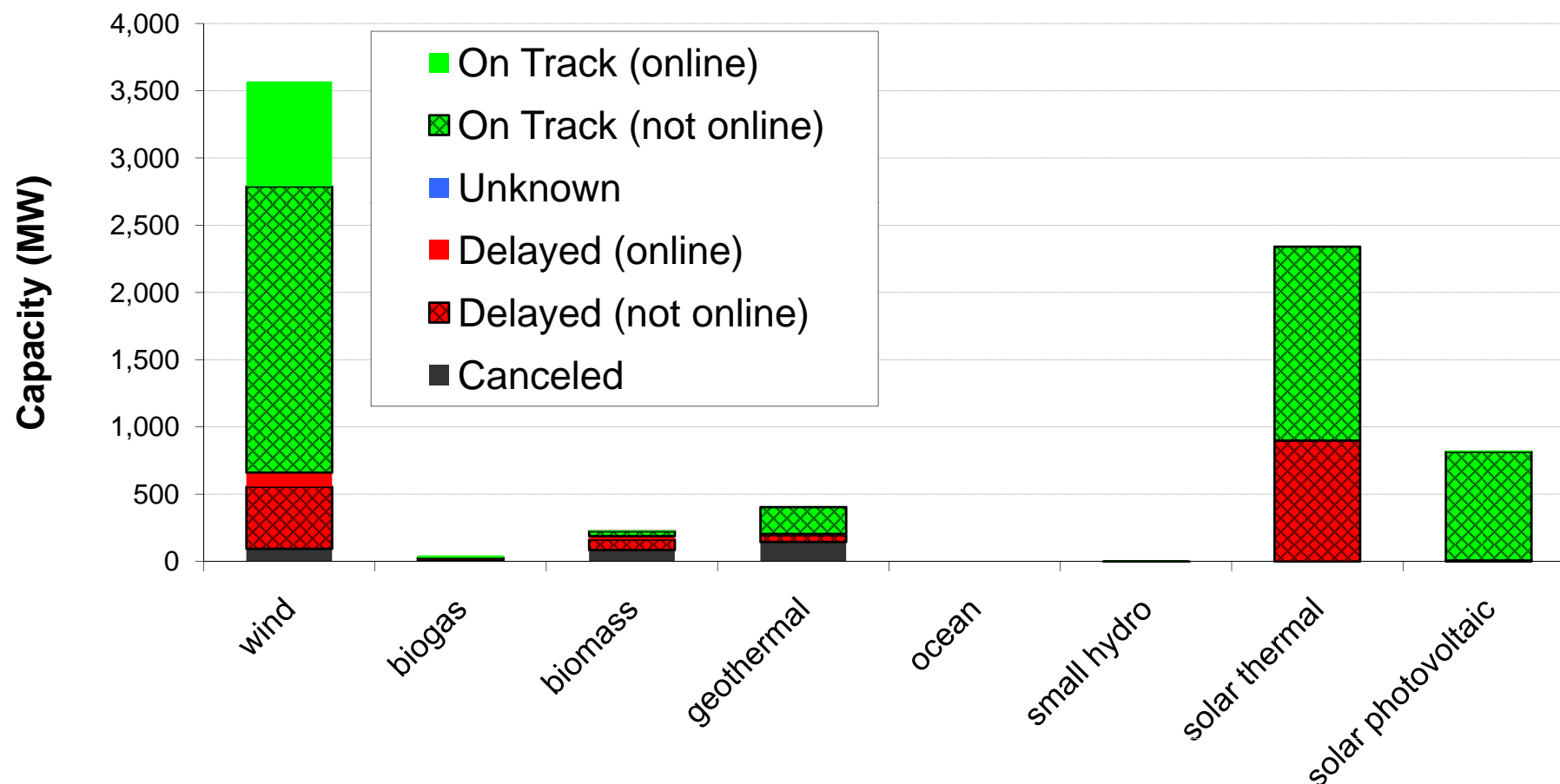
	PG&E (MW)	SCE (MW)	SDG&E (MW)	Total (MW)	Total Projected Deliveries (GWh)
Wind	752 – 777	2,241 – 3,027	567	3,560 – 4,371	10,631 – 12,861
Biogas	9 – 99	12 – 20	24	45 – 143	326 – 1,127
Biomass	102 – 122	59 – 74	92	252 – 287	1,825 – 2,099
Geothermal	346 – 481	335 – 545	60	741 – 1,086	6,304 – 8,893
Ocean	0	0	0	0	0
Small Hydro	1	22 – 110	5	27 – 116	92 – 371
Solar Thermal	1,337–1,737	605 – 1,095	399 – 999	2,341 – 3,831	6,094 – 9,401
Solar PV	817	8 – 22	0	825 – 839	1,703 – 1,735
TOTAL	3,364 – 4,034	3,282 – 4,893	1,145 – 1,745	7,792–10,673	26,974 – 36,487

Source: California Energy Commission, Database of IOU Contracts for Renewable Generation, January 2009 update, www.energy.ca.gov/portfolio/IOU_CONTRACT_DATABASE.XLS. Totals may not sum due to rounding.

Shortage of RPS Contracts for Biomass/Biogas



**Contract Status for New, Repowered, and Re-Started Capacity
from Contracts Signed Since 2002 in IOU database**



Source: California Energy Commission, Database of IOU Contracts for Renewable Generation, January 2009 update,
www.energy.ca.gov/portfolio/IOU_CONTRACT_DATABASE.XLS

Bioenergy Executive Order S-06-06 (RPS Portion of Goal)



Year	Electricity Demand – Statewide Retail Sales (GWh) ¹	Renewable Generation Goals in % (RPS)	Renewable Generation Goals (GWh)	Biomass use goals for EO S-06-06 GWh (20% the renewable generation goal)	Biomass/ Biogas needed to meet Goals (MBDT) ²	Waste Biomass Available (Technical) (MBDT/yr)
2010	272,887	20%	54,577	10,915	9.3	N/A
2012	280,742	20%	56,148	11,230	9.6	36.8
2016	254,609 ³	[28]%	71,291	14,258	11.3	39.6
2020	236,214 ⁴	33%	77,951	15,590	12.5	40.4
2050	514,000 ⁵	[33]%	170,000	34,000 ⁶	27.1	40.4

¹ Statewide Sales by LSE, extended to 2020 California Energy Demand 2008-*2018 Staff Revised Forecast (Provided by EAO)

² Same ratio was used to calculate MBDT needed from Biomass GWh as was used with original forecasted energy demand. The 2012 goal of Biomass GWh was divided by 1173 and the later years were divided by 1258.

³ Used Statewide Total Deliveries minus non RPS deliveries (CDWR, WAPA, and MWD) to get IOU and POU Direct Access Customer retail sales of around 295,000 GWh. Retail sales minus around 40,000 GWh from ARB's Big Bold Energy Efficiency Plan including EE, CHP and CSI (~72,000 GWh total by 2020).

⁴ Used Statewide Total Delivered minus non RPS deliveries (CDWR, WAPA, and MWD) to get IOU and POU Direct Access Customer retail sales of around 308,000 GWh. Retail sales minus around 72,000 GWh from ARB's Big Bold Energy Efficiency Plan including EE, CHP, and CSI

⁵ From original estimate provided by Energy Commission staff and may be inflated because it does not include ARB's big bold energy efficiency plan, nor CSI

⁶ Executive Order S-06-06 requires the state to meet its RPS with 20% biopower only for the years 2010 and 2020. If this were to extend to the year 2050, 34,000 GWh of generation would need to be produced from Biopower.

Bioenergy Executive Order S-06-06 (cont.)



- About 15,500 GWh of bioenergy (12.5 MBDT of feedstock) needed in 2020 to reach RPS portion of goal.
- Transportation needs about 11.5 MBDT of feedstock for 2020 and 41.5 MBDT for 2050.
- CA technical potential for biomass/biogas: 40.4 MBDT.
- To meet both goals of S-06-06 in 2020 about 24 MBDT of feedstock is needed; amount needed is likely to exceed supply of in-state biomass/biogas for 2050.
- Out-of-state biomass/biogas can be used for RPS portion of goal.

Existing Renewables	GWh	33% Renewables by 2020	GWh
Adjusted CA Retail Sales 33%	236,214		
Renewables needed for 33%	77,950	Biomass needed for 33%	15,590
Assumed existing renewables*	32,469	Existing biomass	6,499
Additional renewables needed	45,481	Biomass net short	9,091

*Existing in-state IOU generation from 2007 IEPR from EAO, POU in-state and IOU and POU out-of-state generation is from 2007 Net System Power Report.

Biomass needed to meet 2020 Bioenergy goal for RPS and Transportation (S-06-06)	MBDT 2020	MBDT 2050
Biomass/Biogas needed (MBDT/yr)	12.5	27.1*
Transportation needed (MBDT/yr)	11.4	41.5
Total Biomass needed (MBDT/yr)	23.9	68.6*
Biomass Available (Technical MBDT/yr)	40.4	40.4

*This will be lower if AB32 Scoping Plan goals are met.

Biomass/Distributed PV 33% Scenario Resource Mix



Resources Selected by Type (Excludes Existing Resources)						
	In-state		Out-of-state		Total	
	MW	GWh	MW	GWh	MW	GWh
Biomass - Composite Agricultural Residues (RETI)	24	168	0	0	24	168
Biomass - Composite Wood Residues (RETI)	252	1766	0	0	252	1766
Biomass - Forest Thinnings/Slash (RETI)	128	898	0	0	128	898
Biomass - Mill Residues (RETI)	21	147	197	1380	218	1527
Biomass - Multifuel (RETI)	301	2108	85	595	386	2703
Biomass - Other (Contracted)	172	1266	40	280	212	1546
Biogas (Contracted)	73	501	0	0	73	501
Solar Thermal Electric	880	2190	0	0	880	2190
Solar - Photovoltaic	807	1664	0	0	807	1664
Distributed Solar	8102	17039	0	0	8102	17039
Solar Thermal/Biopower Hybrid	156	1004	0	0	156	1004
Geothermal	351	2667	212	1565	563	4232
Wind	2579	8009	784	2244	3363	10253
Total	13846	39481	1318	6064	15164	45491

Biomass/Distributed PV 33% Scenario meeting S-06-06

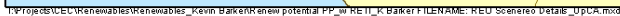


- 77,950 GWh of renewables needed: 33% of an adjusted statewide retail sales from demand forecast (includes Million Solar Roofs, ARB's AB 32 scoping plan goals for EE and CHP)
- Calculation of additional renewables: 77,950 GWh minus existing renewables (32,469 GWh) equals additional renewables (**45,481** GWh in 2020)
- Renewables buildout for 2012 based on projects from Energy Commission's IOU and POU contract databases plus some geothermal from RETI Phase 1B Imperial North CREZ

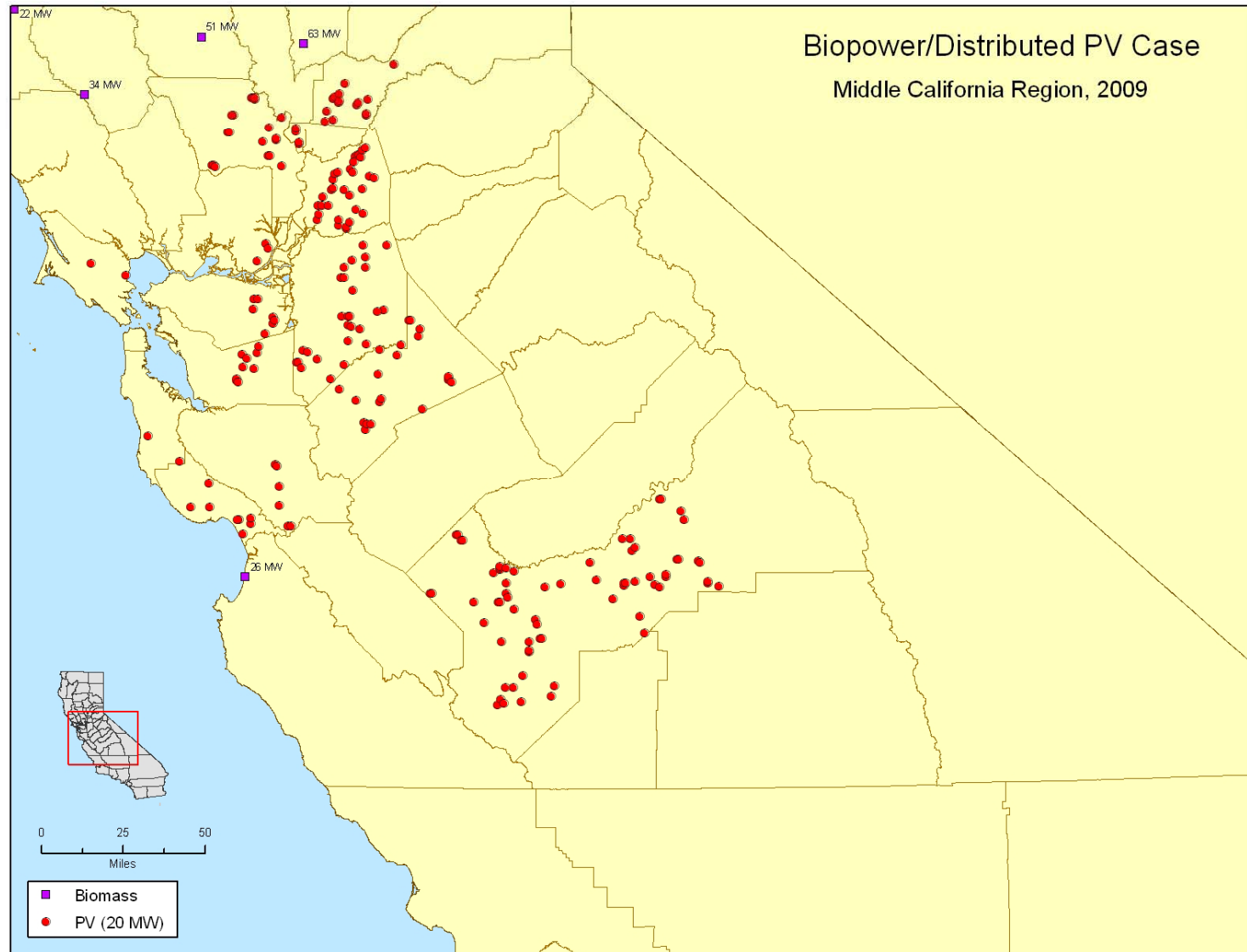
Biomass/Distributed PV 33% Scenario meeting S-06-06 (cont.)



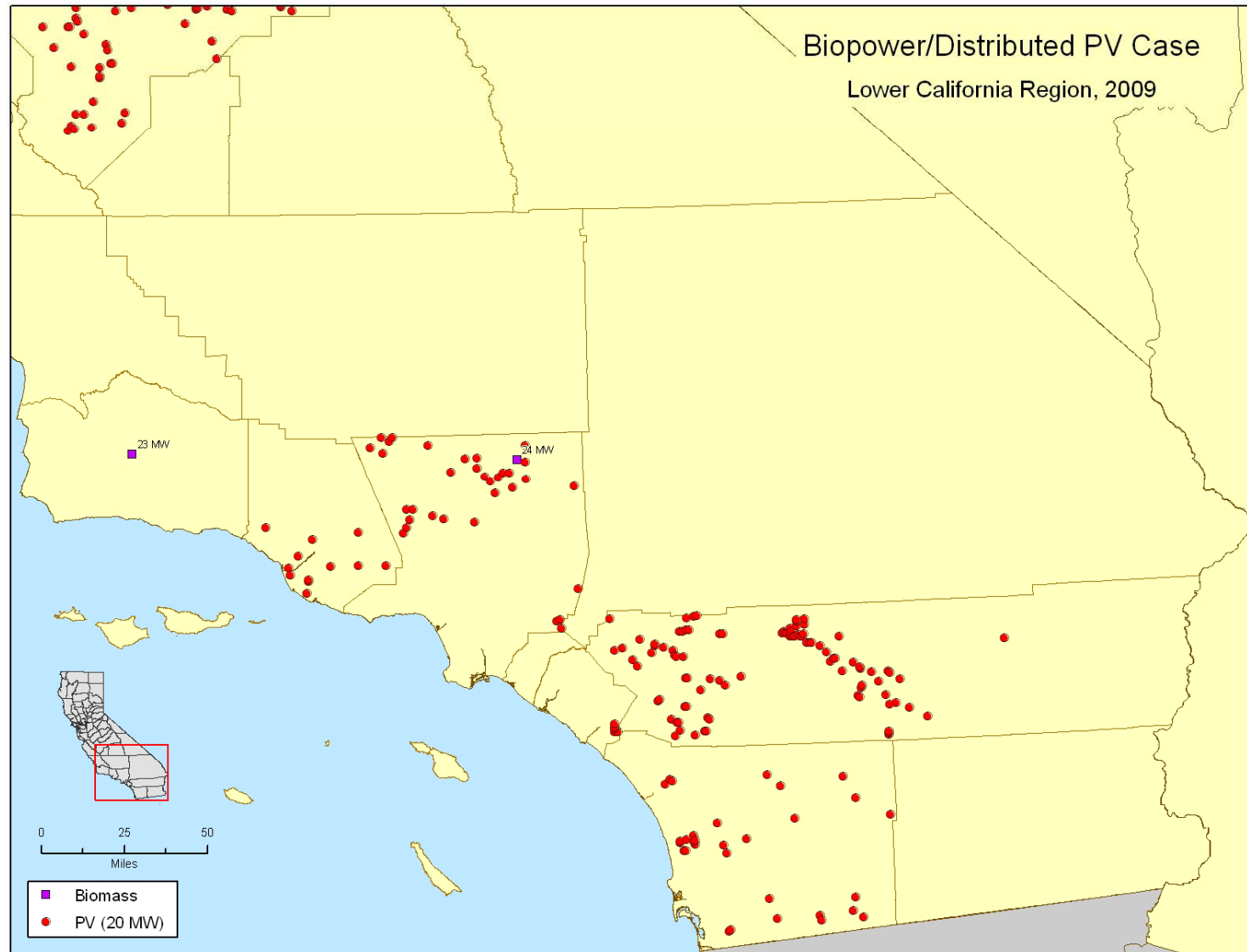
- Biomass projects chosen from RETI Phase 1B in federal attainment counties for PM 2.5, PM 10 and Ozone 8-hour
 - Lowest cost projects chosen first
- Distributed-level PV from RETI Phase 1B selected in counties with highest population densities



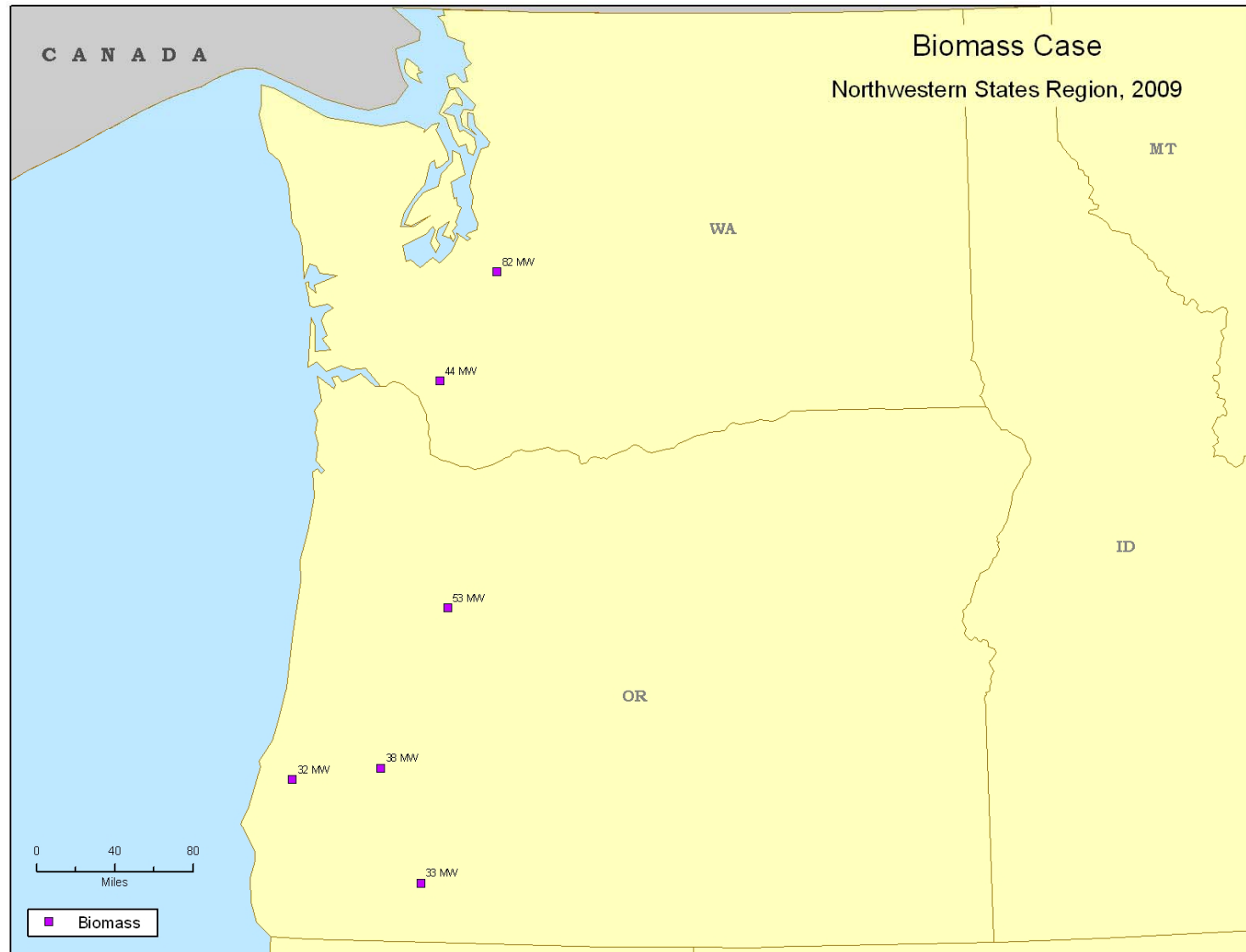
Central California (Biopower and 20-MW PV in Scenario)



Southern California (Biopower and 20-MW PV in Scenario)



Pacific Northwest Region (Biopower in Scenario; no 20-MW PV from this Region in Scenario)



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Additional Information



Thanks to Pam Doughman, Madeleine Meade, Jaqcue Gilbreath, Jason Orta, Garry O'Neill and staff

Please direct questions on this material to:

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