Supporting Workpapers to the Testimony of Hal Snyder and Ron Goodman (Chapters I and II)
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Ch II, pg 6	"The potential for biogas production in SoCalGas' service territory is approximately 150 million standard cubic feet per day (MMscfd) in the following customer activity areas; wastewater treatment facilities (20MMscfd), concentrated animal feeding operations (70MMscfd), and food/green waste processing (60MMscfd)"	7	Potential for Biogas Production - Animal Feeding Operations
Ch II, pg 6	"The potential for biogas production in SoCalGas' service territory is approximately 150 million standard cubic feet per day (MMscfd) in the following customer activity areas; wastewater treatment facilities (20MMscfd), concentrated animal feeding operations (70MMscfd), and food/green waste processing (60MMscfd)"	8	Potential for Biogas Production - Landfill Diverted Food/Green Waste
Ch II, pg 7	"Ten European countries account for over 60% of the biogas upgrading plants worldwide which are successfully injecting renewable natural gas into the utility pipeline network."	9	Breakdown of Biogas Upgrading Plants by Country - 2009
Ch. II, pg 12	"If achieved, this would account for at least 300-500 tons per day of organic waste (per project) that would be diverted from a landfill and produce approximately 1.5 million cubic feet per day (per project) of biogas through an anaerobic digestion process."	3	Estimated Biogas Production from Food Waste
Ch. II, pg 17	"Using the Climate Action Reserve's Organic Waste Protocol31, SoCalGas estimates one economical renewable natural gas injection project has annual emission reductions of 56,250 metric tons of CO2 equivalent (MTCO2e) based on 411 tons per day of landfill diverted organic waste that is anaerobically digested."	1	CO2 Reduction Calculation for Post-Consumer Food Waste Diversion Project
Ch. II, pg 17	"This is the equivalent of taking approximately 11,000 passenger vehicles off the road."	1	CO2 Reduction Calculation for Post-Consumer Food Waste Diversion Project
Ch. II, pg 17	"Also, using a carbon credit value of $37.50/ MTCO2e34 would produce annual carbon credits valued at approximately $2.1 million."	2	Estimated Annual Carbon Credit Calculation

Workpaper #1

CO2 Reduction Calculation for Post-Consumer Food Waste Diversion Project

Source for Data/Table Below
Climate Action Reserve - Organic Waste Digestion Project Protocol
Version 2.0, June 29 2011
Table C-3 (Page 92) - Example Digester Plant, Payback Economics
http://www.climateactionreserve.org/wp-content/uploads/2011/10/Organic_Waste_Digestion_Project_Protocol_V2.0_Package_102611.pdf

Parameters	Values (See notes below)
Digester Volume	150,000 tons/year (or 411 tons/day)
Main Substrate	MSW - Post-Consumer Food Waste
Investment Costs	$15,000,000
Annual capital repayment Costs	$3,500,000
Other operating costs (year)	$2,500,000
Total annual costs	$6,000,000
Total revenue	$9,056,000
Net income (before taxes)	$3,056,000

Notes:
1) If the landfill is required to have methane controls, this reduces the methane emitted and therefore the value of GHG credits to $450,000 annually
2) Based on EPA emissions factors for methane emissions from MSW in landfill (sourced from AP 42, Fifth Edition, Volume I Chapter 2: Solid Waste Disposal http://www.epa.gov/ttn/chief/ap42/ch02/index.html) and estimating carbon credit value at $8/ton

Line	Assumptions		Value		Formula
1	Assume the landfill has methane controls.				
2	Digester Volume =		150,000	tons/year	
3	Carbon credit value =	$	8.00	per MTCO2E	
4	GHG Reduction Revenue (with methane control) =	$	450,000	per year	
5	Annual amount of CO2 emissions from passenger vehicle *		5.1	MTCO2E/vehicle/year	
	* Taken from EPA Greenhouse Gas Equivalencies Calculator (Calculations and References) http://www.epa.gov/cleanenergy/energy-resources/refs.html				
	Calculations				
6	Estimated amount of carbon emission reduction		56,250	MTCO2E/year	line 4 / line 3
7	Estimated carbon reduction per ton of diverted food waste		0.375	MTCO2E/ton of food waste	line 6 / line 2
9	Estimated equivalent annual amount of passenger vehicles taken off the road		11,029	passenger vehicles	line 6 / line 5

Workpaper #2

Estimated Annual Carbon Credit Calculation

Source for Data/Table Below

2011 Market Price Referent (MPR) Model, "Var_Comp" sheet, line 29

www.cpuc.ca.gov/NR/rdonlyres/B4F07AB3-0846-403B-ADDD-E6F495826113/0/Final2011MPR.xls

2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	Average
$16.29	$22.29	$26.08	$27.89	$29.88	$32.00	$34.25	$36.65	$39.20	$41.86	$44.71	$47.75	$51.00	$54.47	$58.23	**$37.50**

Line No.	Assumptions	Value		Formula
1	Amount of carbon emission reduction per food waste project (taken from Line 6 of Workpaper #1) =	56,250	MTCO2E/year	
2	Estimated annual average carbon credit value =	$37.50	/MTCO2E	
	Calculations			
	Estimated annual value of carbon credits	$ 2,109,528	per year	line 1 x line 2

Workpaper #3

Estimated Biogas Production from Food Waste

1) SoCalGas has contacted various digester manufacturers and industry consultants and the stated range of 300 to 500 tons of food waste to produce 1.5 million standard cubic feet per day (scfd) of biogas is based on these data points/sources.
2) The source data below is for municipal solid waste and the calculated tonnage per day of waste to produce 1.5 million scfd of biogas generally falls within the 300 to 500 tons per day range.

Source Data for Data/Table Below

GREENING WASTE: ANAEROBIC DIGESTION FOR TREATING THE ORGANIC FRACTION OF MUNICIPAL SOLID WASTES
Karena Ostrem, May of 2004
Table 1 Biogas Yield of Several AD Designs Treating MSW (Page 12)
http://www.seas.columbia.edu/earth/wtert/sofos/Ostrem_Thesis_final.pdf

AD Technology	Biogas Yield (m3/metric ton of feedstock)
BTA	80-120
Valorga	80-160
WAASA	100-150
DRANCO	100-200
Linde	100
Kompogas	130

Line No.	Assumptions	Value		Formula
1	1 metric ton =	0.907	short tons	
2	1 m3 =	35.31	standard cubic feet	
3	Digester "Up Time" =	90%		
4	Estimated amount of biogas to satisfy the economies of scale for biogas upgrading/conditioning* =	1,500,000	standard cubic feet	

	AD Technology	Average biogas production m3/metric ton of feed	
		Low	High
5	BTA	80	120
6	Valorga	80	160
7	WAASA	100	150
9	DRANCO	100	200
9	Linde	100	100
10	Kompogas	130	130

* Based on SoCalGas' lifecycle cost calculations for a typical biogas upgrading/conditioning services tariff project

Calculations

	AD Technology	Estimated average biogas production scf/short ton of feed		
		Low	High	
11	BTA	2,803	4,204	(line 5 x line 2 / line 1) x line 3
12	Valorga	2,803	5,606	(line 6 x line 2 / line 1) x line 3
13	WAASA	3,504	5,256	(line 7 x line 2 / line 1) x line 3
14	DRANCO	3,504	7,007	(line 8 x line 2 / line 1) x line 3
15	Linde	3,504	3,504	(line 9 x line 2 / line 1) x line 3
16	Kompogas	4,555	4,555	(line 10 x line 2 / line 1) x line 3

AD Technology	Estimated range of short tons of feed per day to produce 1.5 million scfd		
	Low	High	
BTA	357	535	line 4 / line 11
Valorga	268	535	line 4 / line 12
WAASA	285	428	line 4 / line 13
DRANCO	214	428	line 4 / line 14
Linde	428	428	line 4 / line 15
Kompogas	329	329	line 4 / line 16

Workpaper #4

Estimated Amount of Renewable Natural Gas from 20 Biogas Conditioning/Upgrading Systems

Line No.	Assumptions/Descriptions		Value	Formula
1	In speaking with customers across the waste hauling, livestock, and wastewater treatment plant industries, SoCalGas believes there will be roughly 20 projects in SoCalGas' territory over the next 5-10 years that will likely provide enough feedstock to justify an economical project without incentives.	20	projects	
2	Estimated amount of biogas to satisfy the economies of scale for biogas upgrading/conditioning* =	1,500,000	standard cubic feet per day	
	* Based on SoCalGas' lifecycle cost calculations for a typical biogas upgrading/conditioning services tariff project			
	Calculations			
	Estimated amount of renewable natural gas that can be produced by twenty Biogas Conditioning/Upgrading Services systems =	30,000,000	standard cubic feet per day	line 1 x line 2

Workpaper #5

Estimated Amount of Renewable Power Generated from 20 RNG Pipeline Injection Projects

Line No.	Assumptions	Value		Formula
1	Estimated Number of Biogas Conditioning/Upgrading Projects =	20		
2	Estimated amount of biogas to satisfy the economies of scale for biogas upgrading/conditioning* =	1,500,000	cubic feet/day	
3	Methane content of biogas =	60%		
4	Methane recovery from Biogas Conditioning/Upgrading System =	90%		
5	Biogas Conditioning/Upgrading Services capacity factor =	95%		
6	Heating value of injected renewable natural gas (RNG) =	990	btu/cubic foot	
7	Heat rate of Combine Cycle Power Plant (RPS Certified) =	6924	btu/kWh **	
8	Base load capacity factor for power plant =	0.92		
	* Based on SoCalGas' lifecycle cost calculations for a typical biogas upgrading/conditioning services tariff project			
	** From 2011 Market Price Referent (MPR) Model - "Heat Rate" Sheet. Avg of adjusted heat rate value.			
	www.cpuc.ca.gov/NR/rdonlyres/B4F07AB3-0846-403B-ADDD-E6F495826113/0/Final2011MPR.xls			
	Calculations			
9	Total amount of biogas =	30,000,000	cubic feet/day	line 1 x line 2
10	Total amount of RNG injected into pipeline =	15,390,000	cubic feet/day	line 3 x line 4 x line 5 x line 9
11	Convert cubic feet per day into btu per day =	15,236,100,000	btu/day	line 6 x line 10
12	Total amount of kWh's produced from RNG =	2,200,477	kWh's per day	line 11 / line 7
13	Convert kWh's into MWh's =	2,200	MWh's per day	line 12 / 1,000
	Generation capacity from RNG =	100	MW	(line 13 / line 8)/ 24

Workpaper #6

Potential for Biogas Production - Wastewater Treatment Facilities

Source for Data/Table Below

Sewage Wastewater Treatment Plants in California

Report/Data Author: Lauren V. Fondahl (US EPA, Region 9)

Data has been sorted to reflect only wastewater treatment facilities (WWTF) located within SoCalGas' service territory

FACNAME	FACOWNER	STREET	CITY	COUNTY	ZIPCODE	OPSTREET	OPCITY	OPZIP	INMGD
Brawley STP	City of Brawley	400 Main St.	Brawley	Imperial	92227	5011 Best Rd.	Brawley	92227	3.2
Calexico WWTP No. 1	City of Calexico	608 Heber Ave	Calexico	Imperial	92231	298 East Anza Rd.	Calexico	92231	2.3
El Centro WPCP	City of El Centro	P.O. Box 4450	El Centro	Imperial	92244-4450	2255 La Brucherie Rd.	El Centro	92244	4.8
North of River San Dist No. 1	North of River San Dist No. 1	5001 Olive Dr.	Bakersfield	Kern	93308	5001 Olive Dr.	Bakersfield	93308	3.2
Bear Valley CSD	Bear Valley CSD	28999 South Lower Valley Rd.	Tehachapi	Kern	28999				0.25
Tehachapi WTP	City of Tehachapi	P.O. Box 668	Tehachapi	Kern	93581-0668	800 Enterprise Way	Tehachapi	93561	0.7
Bakersfield Plant 2	City of Bakersfield	1501 Truxtun Ave	Bakersfield	Kern	93301	1700 East Planz Rd	Bakersfield	93307	16.32
Bakersfield Plant 3	City of Bakersfield	1501 Truxtun Ave	Bakersfield	Kern	93301	8101 Ashe Rd.	Bakersfield	93313	10.38
Delano WWF	City of Delano	725 S. Lexington St.	Delano	Kern	93215	1107 Lytle St.	Delano	93215	4.4
Kern CSA - Mt. Vernon WWTP	Kern County Sanitation Auth	2700 M St., Suite 500	Bakersfield	Kern	93301	HWY 58 @ Mt. Vernon St.			3.8
Lamont WTF	Lamont PUD	8624 Segrue Rd.	Lamont	Kern	93241				4.1
Ridgecrest WTF	City of Ridgecrest	100 W. California Ave	Ridgecrest	Kern	93555	Knox Road	China Lake NWC	93555	3.6
Shafter WTF	City of Shafter	336 Pacific Ave.	Shafter	Kern	93263	1884 South Shafter Ave	Shafter	93263	1.2
Taft WTF	City of Taft	209 East Kern St.	Taft	Kern	93268	Airport Rd.	Taft	93268	1.2
Wasco PUD WTF	City of Wasco	746 8th St.	Wasco	Kern	93280				1.5
California Correctional Inst. Tehachapi	CA Dept of Corrections	P.O. Box 1031	Tehachapi	Kern	93581				1
Corcoran WTF	City of Corcoran	1033 Chittenden Ave	Corcoran	Kings	93212	Pueblo @ 5th	Corcoran	93212	1.2
Hanford WTF	City of Hanford	900 S. Tenth Ave	Hanford	Kings	93230	10555 Houston Ave	Hanford	93230	3.8
Lemoore WTF	City of Lemoore	119 Fox St.	Lemoore	Kings	93245	19 1/2 Ave	Lemoore	93245	1.8
Hyperion TP	City of Los Angeles	12000 Vista del Mar	Playa del Rey	Los Angeles	90293	12000 Vista del Mar	Playa del Rey	90291	437
Terminal Island Treatment Plant	City of Los Angeles	445 Ferry St.	San Pedro	Los Angeles	90731	445 Ferry St.	San Pedro	90731	30
Las Virgenes - Tapia WRF	Las Virgenes MWD	4234 Las Virgenes Rd.	Calabasas	Los Angeles	91302-1994	731 Malibu Canyon Rd.	Calabasas	91302	8.9
LACSD-JWPCP	LACSD	P.O. Box 4998	Whittier	Los Angeles	90607-4998	24501 S. Figueroa St.	Carson	90745	331
Valencia WRP	LACSD	P.O. Box 4998	Whittier	Los Angeles	90607-4998	28185 The Old Road	Valencia	91335	10.2
Lancaster WRP	LACSD	P.O. Box 4998	Whittier	Los Angeles	90607-4998	1865 W. Ave D	Lancaster	93534	9.5
Palmdale WRP	LACSD	P.O. Box 4998	Whittier	Los Angeles	90607-4998	39300 30th St. East	Palmdale	93550	8.07
Burbank WRF	City of Burbank	275 East Olive Ave.	Burbank	Los Angeles	91510-6459	2 West Chestnut St.	Burbank	91502	5.4
Avalon - Santa Catalina Island STP	City of Avalon	P.O. Box 707	Avalon	Los Angeles	90704	Pebbly Beach Rd.	Avalon	90704	1.2
Orange County S.D. Plant No. 1	Orange County Sanitation Dist.	P.O. Box 8127	Fountain Valley	Orange	92728-8127	10844 Ellis	Fountain Valley	92708-7018	89
Orange County Sanitation Dist. Plant 2	Orange County Sanitation Dist.	P.O. Box 8127	Fountain Valley	Orange	92728-8127		Huntington Beach		155
Aliso Joint Regional Plant	Aliso Water Management Agency	30290 Rancho Viejo Rd.	San Juan Capistrano	Orange	92675	29201 La Paz Rd.	Laguna Niguel	92656	12
Los Alisos WWTP	Los Alisos Water District	30290 Rancho Viejo Rd.	San Juan Capistrano	Orange	92675	22312 Muirlands Blvd.	El Toro	92630-0699	5.5
SERRA Latham WWTP	South East Regional Rec. Auth.	30290 Rancho Viejo Rd.	San Juan Capistrano	Orange	92675	34156 Del Obispo	Dana Point	92629	13
Santa Margarita Chiquita WRP	Santa Margarita Water District	30290 Rancho Viejo Rd.	San Juan Capistrano	Orange	92675	28793 Ortega Highway	San Juan Capistrano	92675	2.2
San Clemente WRP	San Clemente	30290 Rancho Viejo Rd.	San Juan Capistrano	Orange	92675	380 Avenida Pico	San Clemente	92672	4.9
Valley Sanitary District	Valley Sanitary District	45-500 Van Buren St.	Indio	Riverside	92201	45-500 Van Buren	Indio	92201	5.1
EMWD: Hemet/San Jacinto RWRF	Eastern Municipal Water Dist.	P.O. Box 8300	San Jacinto	Riverside	92581-8300				11
EMWD - Moreno Valley RWRF	Eastern Municipal Water Dist.	P.O. Box 8300	San Jacinto	Riverside	92581-8300	17010 Perris	Moreno Valley		16
EMWD - Perris Valley RWRF	Eastern Municipal Water Dist.	P.O. Box 8300	San Jacinto	Riverside	92581-8300	1330 Watson	Perris		11
EMWD - Sun City RWRF	Eastern Municipal Water Dist.	P.O. Box 8300	San Jacinto	Riverside	92581-8300	29541 Murrieta Rd.	Sun City		3
EMWD - Temecula Valley RWRF	Eastern Municipal Water Dist.	P.O. Box 8300	San Jacinto	Riverside	92581-8300	42565 Avenida Alvarado	Temecula	92392	8
Elsinore Valley Water District	Elsinore Valley Water District	P.O. Box 3000	Lake Elsinore	Riverside	92531-3000	18200 Treleven Ave	Lake Elsinore	92530	3.3
Riverside	City of Riverside	5950 Acorn St.	Riverside	Riverside	92504	5950 Acorn St.	Riverside	92504	30
Banning STP	City of Banning	2242 E. Charles St.	Banning	Riverside	92220	2242 E. Charles St.	Banning	92220	1
Coachella Valley - Palm Desert WTP	Coachella Valley Water Dist.	P.O. Box 1058	Coachella	Riverside	92236	43-300 Cook St.	Palm Desert	92260	10
Coachella Valley Mid-Valley WRF	Coachella Valley Water Dist.	P.O. Box 1058	Coachella	Riverside	92236	Filmore			1.1
Palm Springs WWTP	City of Palm Springs	4375 Mesquite Ave.	Palm Springs	Riverside	92264	4375 Mesquite Ave	Palm Springs	92264	8.45
Beaumont STP	City of Beaumont	550 East Sixth St.	Beaumont	Riverside	92223	550 East Sixth St.	Beaumont	92223	1
Blythe WWTP	City of Blythe	440 South Main St.	Blythe	Riverside	92225	15901S. Broadway	Blythe	92225	1.5
Coachella STP	City of Coachella	1515 Sixth St.	Coachella	Riverside	92236	87-075Ave 54	Coachella	92236	0.5
Coachella San Dist. WTP	Coachella Sanitary District	1515 Sixth St.	Coachella	Riverside	92236	Ave 54 at storm channel	Coachella	92236	2.1
Corona STP 1	City of Corona	815 West Sixth St.	Corona	Riverside	91720	1904 Clearwater Dr.	Corona	91720	9.8
Corona STP 2	City of Corona	815 West Sixth St.	Corona	Riverside	91720	1904 Clea			2.2
Western Riverside Regional WW Facility	United Water Services, Inc	2242 E. Charles St.	Banning	Riverside	92220	14634 River Rd.	Corona		0
Chino Basin - Carbon Canyon STP	Chino Basin MWD	P.O. Box 697	Rancho Cucamonga	San Bernadino	91729	Carbon Canyon Rd.	Chino		9.1
Barstow	City of Barstow	220 East Mountain View St.	Barstow	San Bernadino	92311-2888	2200 E. Riverside Dr.	Barstow	92311	2.6
Chino Basin RP 1	Chino Basin MWD	P.O. Box 697	Rancho Cucamonga	San Bernadino	91729-0697	2450 East Philadelphia Ave.	Ontario	91761	37
Chino Basin RP 2	Chino Basin MWD	P.O. Box 697	Rancho Cucamonga	San Bernadino	91729	16400 El Prado Ave	Chino	91710	4
Yucaipa Valley - Henry Wochholz WWTP	Yucaipa Valley Water District	P.O. Box 730	Yucaipa	San Bernadino	92399	880 W. County Line Rd.	Yucaipa		4.5
Rialto WTP	City of Rialto	150 S. Palm Ave	Rialto	San Bernadino	92376	501 E. Santa Ana Ave.	Bloomington	92316	5
Colton WTP	City of Colton	650 N. La Cadena Dr.	Colton	San Bernadino	92324	1201 South Rancho Ave.	Colton	92324	5.4
Needles WWTP	City of Needles	P.O. Box 887	Needles	San Bernadino	92363	516 East Broadway	Needles	92363	1
Big Bear Area Regional WWA WTP	Big Bear Area Regional WWA	P.O. box 517	Big Bear City	San Bernadino	92314	122 Palomino Dr.	Big Bear City	92314	3.2
Crestline San Dist. (3 WTP's)	Crestline Sanitation Districts	P.O. box 3395	Crestline	San Bernadino	92325-3395				1.1
Redlands STP	City of Redlands	P.O. Box 3005	Redlands	San Bernadino	92373	1950 Nevada St.	Redlands	92373	12
Victor Valley WTP	Victor Valley WWRA	20111 Shea Rd.	Victorville	San Bernadino	92394	20111 Shea Rd.	Victorville	92394	5.5
Silver Lake WWTP	County of San Bernadino W&SO	12402 Industrial Blvd, Bldg D Suite 6	Victorville	San Bernadino	92392	27079 Helendale Rd.	Helendale	92342	0.37
909 Bernadino WWTP	City of San Bernadino	299 Blood Bank Rd.	San Bernardino	San Bernardino	92408	299 Bloodbank Rd.	San Bernardino	92408	24
Cambria Community Services District	Cambria CSD	P.O. Box 65	Cambria	San Luis Obispo	93428	Heath Lane	Cambria	93428	0.5
Pismo Beach WWTP	City of Pismo Beach	P.O. Box 3	Pismo Beach	San Luis Obispo	93448	550 Frady Lane	Pismo Beach	93449	1.1
San Luis Obispo WTP	City of San Luis Obispo	955 Morro St.	San Luis Obispo	San Luis Obispo	93401	25 Prado Rd.	San Luis Obispo	93401	4.5
Morro Bay/Cayucos WTP	City of Morro Bay	695 Harbor St.	Morro Bay	San Luis Obispo	93442	160 Atascadero Rd.	Morro Bay	93442	1.7
South San Luis Obispo County SD	South SLO CSD	P.O. Box 339	Oceano	San Luis Obispo	93445	1600 Aloha Place	Oceano	93445	2.7
Paso Robles WTP	City of Paso Robles	P.O. Box 307	Pso Robles	San Luis Obispo	93446	3400 Sulfer Springs Rd.	Paso Robles	93446	2.2
Lompoc Regional WWP	City of Lompoc	P.O. Box 8001	Lompoc	Santa Barbara	93438-8001	2500 W. Central Ave	Lompoc	93438	5
Laguna County Sanitation District	Laguna County San Dist.	624 West Foster Rd., Suite D	Santa Maria	Santa Barbara	93455	3500 Black Rd.	Santa Maria	93455	1.7
Goleta Sanitary District	Goleta Sanitary District	P.O. Box 906	Goleta	Santa Barbara	93116	1000 Fowler Rd.	Goleta	93116	6.05
Santa Maria WWTP	City of Santa Maria	601 South Black Rd.	Santa Maria	Santa Barbara	93454-9701	601 Black Rd.	Santa Maria	93454	6.7
Carpinteria WWTP	Carpinteria Sanitary District	P.O. Box 571	Carpinteria	Santa Barbara	93013	5351 Sixth St.	Carpinteria	93013	1.4
Montecito WTP	Montecito Sanitary District	1042 Monte Cristo Lane	Santa Barbara	Santa Barbara	93108	910 Channel Dr.	Santa Barbara	93108	1
Santa Barbara - El Estero WWTP	City of Santa Barbara	P.O. Box 1990	Santa Barbara	Santa Barbara	93102-1990	520 East Yanonali St.	Santa Barbara	93101	8.12
Visalia WCP	City of Visalia	7579 Ave. 288	Visalia	Tulare	93277	7579 Avenue 288	Visalia	93277	11
Porterville STF	City of Porterville	1333 West Grand Ave.	Porterville	Tulare	93258	1333 W. Grand Ave.	Porterville	93257	4.19
Cutler-Orosi STF	Cutler-Orosi Joint Powers WA	40401 Road 120	Cutler	Tulare	93615	40401 Road 120	Cutler	93615	1.4
Dinuba WTF	City of Dinuba	110 South College Ave	Dinuba	Tulare	93618	6675 Avenue 412	Dinuba	93618	1.6
Exeter WWF	City of Exeter	P.O. Box 237	Exeter	Tulare	93221	Myers Ave	Exeter	93221	1
Farmersville WTF	City of Farmersville	147 East Front St.	Farmersville	Tulare	93223	1 mile north of Farmersville		93223	1.2
Lindsay WWF	City of Lindsay	251 Honolulu St.	Lindsay	Tulare	93247	23611 Road 196	Lindsay	93247	1.2
Ojai Valley Sanitary District	Ojai Valley Sanitary District	1072 Tico Rd.	Ojai	Ventura	93023	6363 N. Ventura Ave.	Ventura	93001	2.36
Point Mugu Naval Air Weapons Station	U.S. Navy	Code 833210E	Point Mugu	Ventura	93042-5001				0
Ventura WRF	City of San Buenaventura	P.O. Box 99	San Buenaventura	Ventura	93002-0099	400 Spinnaker Dr.	San Buenaventura	93002	7.7
Camarillo WRP	Camarillo Sanitary District	P.O. Box 248	Camarillo	Ventura	93011	150 Howard Rd.	Camarillo	93010	4.68
Oxnard STP	City of Oxnard	305 West Third St.	Oxnard	Ventura	93030	6001 South Perkins Rd.	Point Hueneme	93001	18.98
Simi Valley WQCP	Simi Valley County San Dist	2929 Tapo Canyon Rd.	Simi Valley	Ventura	93063	600 West Los Angeles Ave.	Simi Valley	93065	9.1
Thousand Oaks - Hill Canyon WTP	City of Thousand Oaks	2100 Thousand Oaks Blvd.	Thousand Oaks	Ventura	91362-2903	9600 Santa Rosa Rd.	Camarillo	93010	9.58
Ventura Co PWA - Moorpark STP	Ventura Co PWA	7150 Walnut Canyon Rd.	Moorpark	Ventura	93020	9550 Los Angeles Ave.	Moorpark	93021	3
Ventura RSD - Santa Paula WRP	Ventura RSD	1001 Partridge Dr. Suite 150	Ventura	Ventura	93002-2277	905 Corporation St.	Santa Paula	93060	2.5
								Total	**1,554** MGD

Line No.	Assumptions	Value		Formula
1	Total Design MGD of WWTF's within SoCalGas Service Territory (see table above) =	1,554	MGD	
2	Estimated amount of biogas production per Design MGD* =	8.26	scfm/MGD	
	* Ratio was calculated by reviewing actual biogas production data and MGD values for various WWTF's			

Calculations

Total Biogas Production Potential =	18.5	MMscfd	(line 1 x line 2) x 60 x 24 / 1,000,000

Workpaper #7

Potential for Biogas Production - Animal Feeding Operations

Source for Data/Table Below

United States Department of Agriculture National Agricultural Statistics Service
May 22, 2012
http://www.nass.usda.gov/Statistics_by_State/California/Publications/County_Estimates/201005lvscef.pdf
Data has been sorted to only reflect estimated number of milk cows within SoCalGas' service territory

Line No.	Description	Value	Formula
	Cow Count by County within SoCalGas Service Territory		
	County	**Milk Cows**	
1	Fresno*	57,500	
2	Kern	160,000	
3	Kings	165,000	
4	San Joaquin	100,000	
5	Tulare	435,000	
6	Imperial	10,200	
7	Los Angeles	4,100	
8	Riverside	48,500	
9	San Bernardino	89,000	
10	Santa Barbara	2,800	
11	**Total**	**1,072,100**	

Calculations

12	Biogas production per milk cow** =	65	scfd	
	Total Biogas Production Potential =	70	MMscfd	line 11 x line 12 / 1,000,000

* Assumes 50% of the milk cows in Fresno are within SoCalGas' service territory
** Source: "CPUC Self Generation Program - Cost-Effectiveness of Distributed Generation Technologies", Appendix A-6
Prepared by ITRON
February 9, 2011
http://www.cpuc.ca.gov/NR/rdonlyres/2EB97E1C-348C-4CC4-A3A5-D417B4DDD58F/0/SGIP_CE_Report_Final.pdf

Workpaper #8

Potential for Biogas Production - Landfill Diverted Food/Green Waste

Source for Data/Table Below

CalRecycle Landfill Tonnage Reports

http://www.calrecycle.ca.gov/SWFacilities/Landfills/Tonnages/

Data has been sorted to reflect only landfills located within or near SoCalGas' service territory

Solid Waste Landfillling Data — **As reported by the landfills for IWM Fee assessment**

2010 Landfill Summary Tonnage Report

Sorted by Solid Waste Information System (SWIS) ID

SWIS ID	Site Name	County	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	2010 Total
10-AA-0009	American Avenue Disposal Site	Fresno	93,075	98,302	89,720	102,680	**383,777**
10-AA-0013	Orange Avenue Disposal Inc	Fresno	0	0	0	0	**0**
13-AA-0001	Imperial Solid Waste Site	Imperial	367	431	572	568	**1,938**
13-AA-0004	Calexico Solid Waste Site	Imperial	411	506	460	377	**1,754**
13-AA-0005	Ocotillo Solid Waste Site	Imperial	0	0	0	0	**0**
13-AA-0006	Holtville Solid Waste Site	Imperial	0	0	0	0	**0**
13-AA-0007	Palo Verde Solid Waste Site	Imperial	0	0	0		**0**
13-AA-0008	Brawley Solid Waste Site	Imperial	0	0	0	0	**0**
13-AA-0009	Niland Solid Waste Site	Imperial	209	246	0	0	**455**
13-AA-0010	Hot Spa Solid Waste Site	Imperial	0	0	0	0	**0**
13-AA-0011	Salton City Solid Waste Site	Imperial	341	457	1,393	1,227	**3,418**
13-AA-0012	Picacho Cut And Fill Site	Imperial	123	168	152	0	**443**
13-AA-0019	Imperial Landfill	Imperial	33,132	36,639	30,940	31,464	**132,175**
13-AA-0022	Monofill Facility	Imperial	19,759	26,198	19,512	19,088	**84,557**
13-AA-0026	Mesquite Regional Landfill	Imperial	0	0	0	0	**0**
15-AA-0045	Boron Sanitary Landfill	Kern	1,013	722	677	598	**3,010**
15-AA-0047	Buttonwillow Sanitary Landfill	Kern	0	0	0	0	**0**
15-AA-0050	Arvin Sanitary Landfill	Kern	0	0	0	0	**0**
15-AA-0052	Lost Hills Sanitary Landfill	Kern	0	0	0	0	**0**
15-AA-0057	Shafter-Wasco Recycling & Sanitary LF	Kern	30,879	30,166	29,614	28,104	**118,763**
15-AA-0058	Mojave-Rosamond Sanitary Landfill	Kern	3,425	2,048	1,779	1,412	**8,664**
15-AA-0059	Ridgecrest Recycling & Sanitary Landfill	Kern	11,718	13,295	12,511	11,981	**49,505**
15-AA-0061	Taft Recycling & Sanitary Landfill	Kern	7,818	8,019	7,895	8,529	**32,261**
15-AA-0062	Tehachapi Sanitary Landfill	Kern	15,016	16,708	16,268	14,817	**62,809**
15-AA-0067	North Belridge Landfill	Kern	0	0	0	0	**0**
15-AA-0105	McKittrick Waste Treatment Site	Kern	15,495	21,665	27,039	17,087	**81,286**
15-AA-0150	Main Base Sanitary Landfill, Edwards AFB	Kern	1,190	1,435	846	1,000	**4,471**
15-AA-0153	Valley Tree & Construction Disposal Site	Kern	0	0	0	0	**0**
15-AA-0257	Clean Harbors Buttonwillow LLC	Kern	26,807	19,480	22,607	36,972	**105,866**
15-AA-0273	Bakersfield Metropolitan (Bena) SLF	Kern	108,133	109,119	105,323	109,810	**432,385**
15-AA-0278	U.S. Borax Inc-Gangue/Refuse Waste Pile	Kern	0	0	0	0	**0**
15-AA-0308	H.M. Holloway Landfill	Kern	5,429	6,967	7,771	5,327	**25,494**
16-AA-0004	Avenal Regional Landfill	Kings	111,790	112,122	115,979	104,470	**444,361**
16-AA-0021	CWMI, KHF (MSW Landfill B-19)	Kings	21,278	21,540	23,318	24,374	**90,510**
16-AA-0023	Kettleman Hills - B18 Nonhaz Codisposal	Kings	8,807	6,489	1,178	2,835	**19,309**
19-AA-0006	Brand Park Landfill	Los Angeles	0	0	0	0	**0**
19-AA-0009	Antelope Valley Public Landfill I	Los Angeles	0	0	0	0	**0**
19-AA-0012	Scholl Canyon Sanitary Landfill	Los Angeles	66,064	61,473	60,203	57,078	**244,818**
19-AA-0013	Azusa Land Reclamation Co. Landfill	Los Angeles	31,007	25,565	22,129	38,513	**117,214**
19-AA-0040	Burbank Landfill Site No. 3	Los Angeles	9,512	9,225	9,293	9,405	**37,435**
19-AA-0050	Lancaster Landfill and Recycling Center	Los Angeles	73,947	60,698	61,346	61,322	**257,313**
19-AA-0052	Chiquita Canyon Sanitary Landfill	Los Angeles	229,343	247,204	291,703	321,544	**1,089,794**
19-AA-0053	Puente Hills Landfill	Los Angeles	545,708	474,069	438,444	382,553	**1,840,774**
19-AA-0056	Calabasas Sanitary Landfill	Los Angeles	64,352	67,027	64,240	57,641	**253,260**
19-AA-0057	Pitchess Honor Ranch Landfill	Los Angeles	0	0	0	0	**0**
19-AA-0061	Pebbly Beach (Avalon) Disposal Site	Los Angeles	600	796	1,067	622	**3,085**
19-AA-0063	San Clemente Island Landfill	Los Angeles	0	0	0	0	**0**
19-AA-0838	Peck Road Gravel Pit	Los Angeles	0	0	0	0	**0**
19-AA-0853	Sunshine Canyon SLF County Extension	Los Angeles	176,607	183,191	187,470	186,010	**733,278**
19-AA-2000	Sunshine Canyon City/County Landfill	Los Angeles	412,081	427,447	437,430	434,023	**1,710,981**
19-AA-5624	Antelope Valley Public Landfill I and II	Los Angeles	43,176	40,928	35,110	34,431	**153,645**
19-AH-0001	Savage Canyon Landfill	Los Angeles	17,945	18,144	19,095	19,957	**75,141**
19-AR-0008	Bradley Landfill West And West Extension	Los Angeles	0	0	0	0	**0**
30-AB-0019	Prima Deshecha Sanitary Landfill	Orange	97,525	99,058	98,389	102,564	**397,536**
30-AB-0035	Olinda Alpha Sanitary Landfill	Orange	419,276	449,297	437,356	422,925	**1,728,854**
30-AB-0360	Frank R. Bowerman Sanitary LF	Orange	340,427	338,017	350,524	366,767	**1,395,735**
33-AA-0006	Badlands Sanitary Landfill	Riverside	120,447	130,282	133,101	132,845	**516,675**
33-AA-0007	Lamb Canyon Sanitary Landfill	Riverside	135,883	134,692	125,405	133,763	**529,743**
33-AA-0015	Oasis Sanitary Landfill	Riverside	403	347	334	323	**1,407**
33-AA-0016	Desert Center Landfill	Riverside	20	0	14	0	**34**
33-AA-0017	Blythe Sanitary Landfill	Riverside	4,862	3,790	3,994	3,610	**16,256**
33-AA-0071	Mecca Landfill II	Riverside	0	0	0	0	**0**
33-AA-0217	El Sobrante Landfill	Riverside	465,328	498,400	520,879	540,861	**2,025,468**
33-AA-0228	Eagle Mountain Landfill	Riverside	0	0	0	0	**0**
36-AA-0017	California Street Landfill	San Bernardino	20,639	20,293	18,241	20,262	**79,435**
36-AA-0045	Victorville Sanitary Landfill	San Bernardino	58,524	66,827	65,831	58,475	**249,657**
36-AA-0046	Barstow Sanitary Landfill	San Bernardino	14,533	20,316	14,264	15,499	**64,612**
36-AA-0051	Colton Sanitary Landfill	San Bernardino	36,558	34,960	34,459	31,280	**137,257**
36-AA-0055	Mid-Valley Sanitary Landfill	San Bernardino	131,737	140,855	135,754	127,530	**535,876**
36-AA-0057	Landers Sanitary Landfill	San Bernardino	10,934	12,441	11,260	11,772	**46,407**
36-AA-0064	Holliday Inertwaste Site	San Bernardino	336	504	0	0	**840**
36-AA-0067	USMC - 29 Palms Disposal Facility	San Bernardino	2,128	2,196	2,494	1,970	**8,788**
36-AA-0068	Fort Irwin Sanitary Landfill	San Bernardino	2,365	2,585	2,392	2,013	**9,355**

36-AA-0074	Mitsubishi Cement Plant Cushenbury L.F.	San Bernardino	0	0	0	0	**0**
36-AA-0087	San Timoteo Sanitary Landfill	San Bernardino	29,285	31,410	30,815	31,990	**123,500**
40-AA-0001	City Of Paso Robles Landfill	San Luis Obispo	9,230	9,430	9,311	8,300	**36,271**
40-AA-0002	Camp Roberts Landfill	San Luis Obispo	0	0	0	0	**0**
40-AA-0004	Cold Canyon Landfill Solid Waste DS	San Luis Obispo	35,496	36,468	36,887	34,685	**143,536**
40-AA-0008	Chicago Grade Landfill	San Luis Obispo	13,469	14,681	15,986	15,063	**59,199**
42-AA-0011	Foxen Canyon Sanitary Landfill	Santa Barbara	0	0	0		**0**
42-AA-0012	Vandenberg AFB Landfill	Santa Barbara	2,146	1,730	1,189	1,272	**6,337**
42-AA-0015	Tajiguas Sanitary Landfill	Santa Barbara	45,061	45,512	44,667	43,564	**178,804**
42-AA-0016	Santa Maria Regional Landfill	Santa Barbara	22,354	23,427	23,483	23,146	**92,410**
42-AA-0017	City Of Lompoc Sanitary Landfill	Santa Barbara	8,187	8,255	8,507	7,934	**32,883**
54-AA-0001	Earlimart Disposal Site	Tulare	0	0	0	0	**0**
54-AA-0004	Teapot Dome Disposal Site	Tulare	12,149	14,115	13,111	13,191	**52,566**
54-AA-0008	Woodville Disposal Site	Tulare	19,527	19,684	19,890	20,862	**79,963**
54-AA-0009	Visalia Disposal Site	Tulare	9,290	12,029	15,688	13,083	**50,090**
56-AA-0005	Toland Road Landfill	Ventura	80,709	83,525	86,939	85,591	**336,764**
56-AA-0007	Simi Valley Landfill & Recycling Center	Ventura	173,946	17,399	174,888	175,471	**541,704**
		Grand Total:	**4,509,331**	**4,421,014**	**4,579,136**	**4,572,430**	**18,081,911**

Line No.	**Assumptions**	**Value**		**Formula**
1	Tons of MSW landfilled in 2010 (per table above) =	18,081,911	tons	
2	California diversion/recycling rate in 2010* =	65%		
3	Assumed tons of MSW generated before diversion/recycling =	27,818,325	tons	line 1 / line 2
	Breakdown of MSW (based on national data)**			
4	- Food Scraps	13.9%		
5	- Yard Trimmings	13.4%		
6	Assumed number of tons per day (50/50 food to yard waste ratio) for biogas upgrading project to be economical =	500	tons/day	
7	Estimated amount of biogas generated per landfill diversion project =	1,500,000	scfd	

* http://www.calrecycle.ca.gov/lgcentral/goalmeasure/DisposalRate/MostRecent/default.htm

** http://www.epa.gov/osw/conserve/materials/organics/food/fd-basic.htm

Calculations

8	Total tons of Food Scraps and Yard Trimmings per Year =	7,594,403	tons/year	line 3 x (line 4 + line 5)
9	Estimated total number of potential landfill diversion projects =	42		line 8 / (line 6 x 365)
	Total Biogas Production Potential =	62	MMscfd	(line 7 x line 9) / 1,000,000

Workpaper #9

Breakdown of Biogas Upgrading Plants by Country - 2009

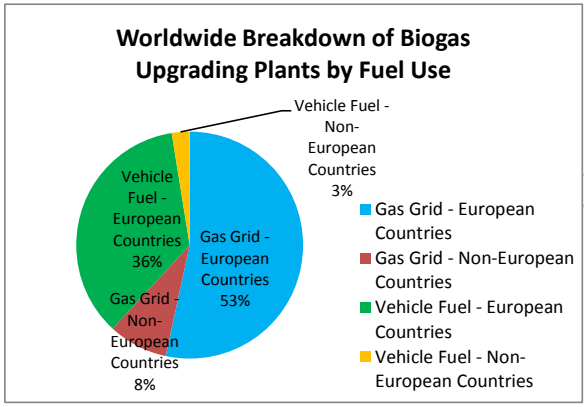
Source for Data/Table Below

"Biogas upgrading technologies - developments and innovations" (pages 16-18)
Anneli Petersson and Arthur Wellinger
October 2009
http://biogasmax.info/media/iea_2biogas_upgrading_tech__025919000_1434_30032010.pdf

Line No.	Country	Value: Total Upgrading Plants*	Value: Upgrading Plants Injecting into "Gas Grid*
1	Austria (European)	5	4
2	Canada	1	1
3	France (European)	1	0
4	Germany (European)	31	30
5	Iceland (European)	1	0
6	Japan	2	0
7	Norway (European)	3	1
8	Netherlands (European)	6	6
9	South Korea	0	0
10	Spain (European)	2	0
11	Sweden (European)	39	8
12	Switzerland (European)	16	14
13	USA	10	9
14	United Kingdom (European)	1	0
15	Totals	118	73
16	Europe Totals	105	63
17	Non-Europe Totals	13	10

* If "Utilisation" column does not identify how the biogas is utilized, it has been omitted from the table

Formula



Calculations

Percentage of "gas grid" injection plants located in European Countries =	86%	(line 16 / line 15)