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To: Environment Commissioners
From: Melanie Nutter, Director (415-235-4076) and Danielle Murray, Renewable Energy Program Manager (415-355-3715)
Date: September 10, 2012
Re: Environmental impact of proposed CCA program

The Board of Supervisors is currently considering changes to San Francisco's proposed Community Choice Aggregation (CCA) program, CleanPowerSF, and approval of a contract with an energy service provider, Shell Energy North America (SENA). This memo provides an analysis of the expected environmental impact of CleanPowerSF as currently proposed, specifically the greenhouse gas reductions.

CleanPowerSF is projected to serve 50,000-90,000 San Francisco customers in its first phase, totaling 20-30 MW of demand. This will primarily be residential customers in targeted geographies, though commercial customers, as well as residents in non-targeted neighborhoods, will be offered the service on an opt-in basis. Under the proposed contract, SENA would procure the electricity for the program from California RPS-eligible renewable resources. Some of this power could come from existing projects and some may be from new projects developed because of San Francisco's market demand. SFPUC would also be able to substitute in local renewable power under the contract. Each project would need to undergo its own environmental review for permitting, and so any project brought on line to provide power to CleanPowerSF would have gone through state review and been deemed to have no significant environmental impact.

Helping San Francisco Meet Its Climate Goals; Synergy with Existing City Policy

San Francisco has a rich history of working aggressively to reduce GHG emissions that cause climate change. In 2002, the Board of Supervisors passed a resolution committing the City to a GHG reduction goal of 20% below 1990 levels by 2012.[1] That ordinance prompted the development of the City's 2004 Climate Action Plan.[2] In 2008, the BOS extended the City's

[1] San Francisco Board of Supervisors, Resolution 158-02: Supporting efforts to Reduce Greenhouse Gas Emissions, City and County of San Francisco, 12 February 2002, www.sfbos.org/ftp/uploadedfiles/bdsupvrs/resolutions02/r0158-02.pdf.
[2] San Francisco Department of Environment, Climate Action Plan, 2004, www.sfenvironment.org/downloads/library/climateactionplan.pdf.

climate goals when it adopted an ordinance establishing GHG reduction targets of 25% below 1990 levels by 2017, 40% below by 2025, and 80% below by 2050.[3]

As of 2010, San Francisco has already reduced GHG emissions to 14.5% below 1990 levels, making San Francisco one of the first jurisdictions to meet and exceed Kyoto Protocol targets.[4] Meeting the city's own aggressive GHG reduction goals for 2025 and beyond will require achieving a nearly GHG-free electricity supply, among other actions related to transportation and waste. The emissions reductions forecast from the proposed CleanPowerSF program would significantly contribute to meeting these goals, with proportionately larger impacts depending on participation rates, as outlined in the tables below. San Francisco has also set a goal of being 100% renewably powered within ten years. The proposed CleanPowerSF program would directly support this goal.

Greenhouse Gas Emissions Reduction Forecast from Phase I of CCA Rollout

As outlined in the Office of the Controller's CleanPowerSF Economic Impact Report[5], the program is expected to result in an increase in both renewable energy demand and conservation and efficiency among program participants (due to the cost premium of the renewable power, and moderate elasticity of electricity demand). A 30 MW program, serving up to 90,000 households, is expected to reduce participants' electricity consumption by 12%, or 32,105 MWh, and deliver 237,367 MWh of renewable energy generation to participants. In total, this would displace 269,472 MWh of electricity currently being provided by PG&E.

Following the GHG calculation protocol recommended by PG&E[6] we have used the CPUC's emissions factor (EF) projections for PG&E's electricity to determine the potential GHG emissions savings from CleanPowerSF. We calculated the average EF for the next 5 years (2013-2017, covering the length of the proposed SENA contract for Phase I of CleanPowerSF) to be 0.18 tonnes CO_2/MWh.[7]

Under the proposed program design, CleanPowerSF would provide 100% California RPS-eligible electricity (from wind, solar, biogas and/or other renewable energy projects). As such, the emissions factor is assumed to be zero. This is in keeping with the Climate Registry's climate inventory protocols adopted by the California Air Resources Board.

Average Annual Emissions Reduction from Reduced Electricity Demand:
32,105 MWh * 0.18 tonnes CO_2/MWh = 5,779 tonnes CO_2 reduction

Average Annual Emissions Reduction from Displacing PG&E Power with CleanPowerSF power:
237,367 MWh * 0.18 tonnes CO_2/MWh = 42,726 tonnes CO_2 reduction

Total Average Annual Phase I Emissions Reduction (2013-2017):
269,472 MWh * 0.18 tonnes CO_2/MWh = 48,505 tonnes CO_2 reduction per year

[3] San Francisco Board of Supervisors, Ordinance 81-08: Climate Change Goals and Action Plan Ordinance, City and County of San Francisco, 26 May 2008.
[4] San Francisco Department of Environment, San Francisco Community GHG Emissions Inventory 2010, March 2012.
[5] Office of the Controller – Office of Economic Analysis, "Contract with Shell Energy for the CleanPowerSF Program: Economic Impact Report," CCSF, 3 August 2012.
[6] See PG&E's GHG Emission Factor Info Sheet at www.pge.com/includes/docs/pdfs/shared/environment/calculator/pge_ghg_emission_factor_info_sheet.pdf.
[7] See E3, GHG Calculator version 3c, worksheet tab "CO2 Allocations," cells AH35 - AH44, http://ethree.com/documents/GHG%20update/GHG%20Calculator%20version%203c_Oct2010.zip

As proposed, CleanPowerSF's Phase I rollout would result in a 0.8% reduction in San Francisco's total GHG emissions compared to 1990 baseline emissions, and bring the percent renewable power delivered to the city to 50% renewable (up from 41% at present).

Greenhouse Gas Emissions Reduction Potential from Full CCA Roll Out

The actual emissions reduction from CleanPowerSF will depend on what percentage of residential, as well as commercial, customers take part in the program. The tables below show the GHG emissions reduction potential for various hypothetical residential and commercial participation scenarios. For example, if the CleanPowerSF program were theoretically expanded to include all 345,811 San Francisco households and 80% of commercial electricity demand this would result in an average GHG reduction of 640,000 tonnes CO_2 per year, reducing our city's total carbon footprint by 9% versus our 1990 GHG inventory baseline, and bringing the total renewable electricity supply for the city to 80%.[8]

Residential Scenarios			
Participation rate in CleanPowerSF	Load reduction from PG&E (MWh/yr)	Average Annual GHG Emissions Reduction (tonnes)	% reduction vs. 1990 total SF emissions
19%*	269,472	48,505	0.8%
25%	354,527	63,815	1.0%
50%	709,055	127,630	2.1%
80%	1,134,488	204,208	3.3%
100%	1,418,110	255,260	4.1%

Commercial Scenarios			
Participation rate in CleanPowerSF	Load reduction from PG&E (MWh/yr)	Average Annual GHG Emissions Reduction (tonnes)	% reduction vs. 1990 total SF emissions
0%*	0	0	0.0%
10%	205,000	36,900	0.6%
20%	409,999	73,800	1.2%
50%	1,024,998	184,500	3.0%
80%	1,639,996	295,199	4.8%

***19% residential and 0% commercial rows corresponds to the size of the Phase I residential-only rollout, based on current household electricity demand and program size as outlined in the Controller's report.*

Alternate Emissions Reduction Calculation – MEA method:

The above emissions projections are done using a conservative emissions factor which assumes that for every kWh not purchased from PG&E, there is an even reduction of electricity production across all of their generating resources, fossil-fuel based or otherwise. Much of PG&E's power is hydroelectric, nuclear, and renewables-based (as required under the state Renewable Portfolio

[8] This assumes all municipal electricity continues to be supplied by Hetch Hetchy and RPS-eligible renewable power, and that both PG&E and Direct Access providers continue to increase their renewable energy content as they move toward compliance with the 2020 33% RPS standard. This percent renewable calculation includes all hydroelectric power and all RPS-eligible renewable power supplied by PG&E, direct access electricity service providers, SFPUC, and CleanPowerSF, based on best available information about electricity supply from each supplier over the next five years.

Standard). Marin Energy Agency (MEA), which oversees Marin County's CCA, recommends calculating GHG emissions reductions in a different manner. Instead of using a projected average emissions factor for PG&E's total supply, MEA uses the emissions factor of the California System Electric System power mix that is currently not in contract and available for purchase by utilities on the "spot market." MEA assumes that customers switching away from PG&E to CCA would not result in PG&E reducing its non-emitting energy sources such as nuclear or hydroelectric production, but rather it would result in PG&E reducing their incremental purchases of electricity from the spot market.[9] This same argument could be made for CleanPowerSF. The electricity purchased on the spot market tends to come from power sources that are much more fossil fuel intensive, such as natural gas and coal, and therefore emit a higher quantity of GHG emissions. The most-recently available EF for this power is 0.309 tonnes CO_2/MWh[10]. If the GHG emissions analysis were expanded to include the impacts at the state level, then CleanPowerSF Phase I customers' departing electrical load could result in more significant average annual reduction of 83,267 tonnes CO_2 per year. If the program were again hypothetically expanded to all residential customers and 80% of commercial customers, the reduction would jump to 944,955 tonnes CO_2 per year. The results of the two GHG accounting methodologies are compared below for both the Phase I rollout as currently proposed, and a hypothetical "full roll out" including all residential customers and 80% of commercial demand.

	GHG Reduction from CCA (tonnes/yr)		**GHG Emissions Reductions vs 1990 baseline[11]**	**Percent of SF Total Electricity Supply from Renewable Energy**
	PG&E Methodology	***MEA Methodology***		
Business As Usual (2010 actuals)	0	0	14.5%	41%
Phase I (19% Res, 0% Comm)	48,505	83,267	15.3%	50%
Hypothetical Full Rollout (100% Res, 80% Comm)	550,459	944,955	23.4%	80%

[9] The City of Richmond has taken this approach in developing its own GHG impact estimates for their participation in Marin Clean Energy. Their analysis can be found here: http://www.ci.richmond.ca.us/DocumentView.aspx?DID=9093.

[10] eGRID year 2007 GHG annual output emission rate for California WECC from EPA, eGRID2010 version 1.1, http://epa.gov/cleanenergy/documents/egridzips/eGRID2010V1_1_year07_GHGOutputrates.pdf.

[11] Increases in GHG emissions reductions from 2010 business as usual value (14.5%) shown in table are only for reductions due to CCA power. Additional reductions are expected from other measures, e.g. waste reduction and diversion, use of alternative transportation, and increasingly clean IOU electricity due to state RPS requirements.