THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
A Department of the City and County of San Francisco, California

San Francisco's 2011 Updated Electricity Resource Plan

Achieving San Francisco's Vision for Greenhouse Gas Free Electricity

Prepared by the San Francisco Public Utilities Commission

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

In Ordinance 81-08, the City and County of San Francisco endorsed a goal for the City to have a greenhouse gas (GHG)[1] free electric system by 2030, generating, deploying and procuring all of its energy needs from renewable and zero-GHG electric energy sources. The purpose of this 2011 Update of San Francisco's 2002 Electricity Resource Plan (2002 ERP)[2] is to identify the next steps that San Francisco must take in order to achieve this ambitious goal.

The purpose of this 2011 Updated ERP is to develop a City-wide plan to meet San Francisco's zero-GHG goal by 2030. Thus, the plan affects not only the San Francisco Public Utilities Commission (SFPUC) in its role of providing electric power to serve municipal facilities (17% of San Francisco's total energy usage) but also the 83% of electric energy currently being supplied to San Francisco by Pacific Gas & Electric (PG&E) and various energy service providers (ESPs).

> The purpose of this 2011 update to San Francisco's 2002 Electricity Resource Plan is to identify strategies that San Francisco could take in order to have a greenhouse gas free electric system by 2030, generating all of its energy needs from renewable and zero-GHG electric energy sources.

The 2002 ERP Set San Francisco On The Right Path

In 2002, the San Francisco Board of Supervisors (BoS) endorsed the 2002 ERP, a bold initiative for San Francisco to control its energy destiny and shape the future use of electric energy within the city. As a result of the adopted policies and actions it fostered, the 2002 ERP has achieved its primary goal of closing down the Hunters Point and Potrero Power Plants,[3] two older, higher-polluting fossil-fueled power plants located in the southeastern portion of the City. Looking back, the 2002 ERP was clearly prescient and ahead of its time, in that it also advocated for reducing greenhouse gases, developing renewable energy, and promoting energy efficiency as far back as 2002.

Since 2002, many of the goals in the 2002 ERP have subsequently been adopted by the State of California, albeit not until the years later, through such legislative and regulatory initiatives as Assembly Bill (AB) 32 - the Global Warming Solutions Act - to reduce GHG emissions, Renewable Portfolio Standards (RPS) that require both PG&E and ESPs to meet 33% of their energy needs by 2020 from selected renewable energy sources,[4] and significantly increased statewide funding for energy efficiency programs to over $1 billion per year.[5]

As a result of these combined activities already underway, GHG emissions associated with San Francisco's electric system have already fallen from 1.7 million tons CO_2 in 2004 to a forecasted 1.3 million tons by 2011. Among the reasons for this reduction are:

- The closure of the Hunters Point and Potrero Power Plants as a result of actions identified in the 2002 ERP;

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[1] Greenhouse gases (GHG) consists of several different gases that contribute to global warming. Although carbon dioxide (CO_2) is produced from the combustion of fossil-fuels is the main source of GHG emissions, other gases such as methane also contribute to global warming.

[2] San Francisco Board of Supervisors Ordinance 94-09.

[3] The Hunters Point Power Plant closed in May 2006. The Potrero Power Plant was closed as of February 28, 2011.

[4] The investor-owned utilities are required to meet their 33% requirement from renewable resources such as solar, wind, geothermal, biomass, and small-scale (under 30 MW) hydroelectric power. These are called state-eligible RPS resources. Publicly-owned utilities were given flexibility to define the types of renewable energy that would count toward their own RPS goals. California's first RPS, enacted in 2002 under Assembly Bill (AB) 1078, adopted a RPS of 20% by 2010. An executive order in 2010 increased the RPS to 33% by 2020.

[5] See Loading Order section below.

- Peak demand for electricity in 2010 being over 15% less than was forecasted in the 2002 ERP, in large part due to extensive energy efficiency efforts by PG&E, San Francisco's Department of the Environment (SFE), the SFPUC, and San Francisco's residents and businesses;
- Over 15 megawatts (MW) of in-city solar facilities that have been installed in San Francisco, split about equally between SFPUC facilities (7 MW) and at over 2,000 privately-owned sites (8 MW); and
- The SFPUC meeting 17% of San Francisco's electric needs by providing zero-GHG energy from its Hetch Hetchy system to serve municipal facilities.

According to Rocky Mountain Institute,[6] continued ("business-as-usual") actions by both San Francisco and the State of California to promote renewable energy and energy efficiency are forecasted to reduce GHG emissions associated with San Francisco's electric energy usage to 1 million tons of CO_2 by 2020, a 40% reduction from 2004 levels. During this entire period, GHG emissions for SFPUC's provision of electric power for the 17% of San Francisco's total load that it serves is forecasted to be zero, with the SFPUC meeting all of its energy needs with zero-GHG Hetch Hetchy and renewable power. Figure 1 also provides a trend line (shown as the dotted red line) which shows the necessary trajectory and yearly progress of GHG reductions that would be need to achieve San Francisco's zero-GHG goal by 2030. The business-as-usual scenario as calculated by RMI did not include any GHG reductions from either adoption of California's cap-and-trade proposal for GHG emissions or post-2020 improvements in California's RPS standards. The combined effect of both of these could further reduce GHG emissions to approximately 600,000 tons by 2030. Even with these additional efforts, an additional 600,000 tons of GHG reductions will have to achieved to reach the 2030 goal.

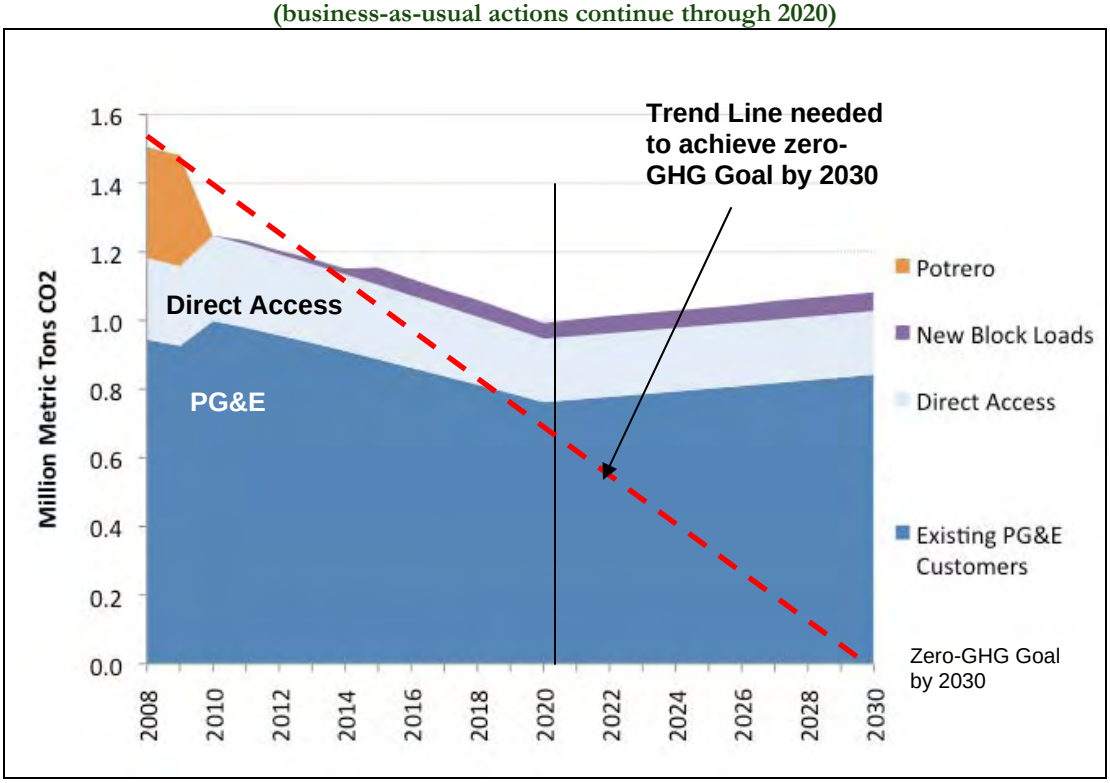
Achieving the additional 1 million ton reduction in GHG emissions needed between now and 2030 to achieve a zero-GHG electric system will require not just continued, but significantly expanded, efforts - not only by San Francisco, but also by state and federal actions. As the 2002 ERP stated:

> Implementation of the Plan will require the cooperation of many organizations, including but not limited to the California Public Utilities Commission (CPUC), the California Independent System Operator (CAISO), the California Energy Commission (CEC), the California Power Authority,[7] Pacific Gas and Electric Company, independent power developers, energy service companies and other departments and agencies of the City and County of San Francisco. (Preface, p. iii)

[6] RMI was the author of the original 2002 ERP and was retained by the SFPUC to determine the feasibility of achieving a zero-GHG electric system by 2030. This forecast is their "Business as Usual" scenario.

[7] Although legally this agency still exists, the Governor's Office has neither chosen to fund nor appoint board members to this agency, making it essentially inactive.

Figure 1
GHG EMISSIONS FOR SAN FRANCISCO'S ELECTRIC SYSTEM ARE FORECASTED TO DECLINE 40% BY 2020
(business-as-usual actions continue through 2020)



SOURCE: RMI Draft Report, Page ES-3
NOTE: SFPUC GHG emissions are forecasted to be zero by RMI

The 2011 Updated ERP Proposes Three Broad Strategies To Reduce GHG Emissions For San Francisco's Electricity

In 2009, through Ordinance 94-09, the Board of Supervisors urged the SFPUC to update the 2002 ERP.

This 2011 Updated Electricity Resource Plan details three broad strategies to keep San Francisco on its path towards zero-GHG emissions from its electric sector, which are described in detail in the body of this report. The strategies recommend:

1. **Empowering San Francisco citizens and businesses** to cost-effectively reduce GHG emissions associated with their own electric energy usage;
2. **Increasing the amount of zero-GHG electricity supplied to the City's customers** from the wholesale energy market; and
3. **Continuing and expanding SFPUC electric service** to guarantee reliable, reasonably-priced, and environmentally sensitive service to its customers.

These strategies can be used to develop a set of priorities and achievable recommendations that leverage the City's existing control and influence, while recognizing the real-world constraints imposed by jurisdictional, regulatory and

commercial factors. Most importantly, the implementable recommendations for each strategy will continue to reduce greenhouse gas emissions and move San Francisco closer to a greenhouse gas free electric system.

The 2011 Updated ERP Recognizes Current Structural And Jurisdictional Constraints

This 2011 Updated ERP is designed to cover all electric energy provided in San Francisco, not just the electric energy provided by the SFPUC to serve municipal facilities.

The major challenge in developing a city-wide electricity resource plan is the fragmented nature of the provision of electric service in San Francisco. Currently, the responsibility for purchasing and procuring San Francisco's electricity needs is divided between PG&E (75% of total usage), direct access providers (8%), and SFPUC's municipal load (17%). This raises various implementation issues.

Control of Energy Procurement Decision-Making. In order to significantly increase the renewable and GHG-free content of San Francisco's electricity supplies, San Francisco and its businesses and residents must either directly participate in the wholesale energy market or influence the wholesale procurement choices currently made by PG&E and other energy service providers, who currently provide 83% of San Francisco's electricity needs. Wholesale procurement choices refer to alternatives for sourcing electricity supplies from the broader Western U.S. electric grid - either through ownership of generating facilities or through purchase contracts - as well as from within San Francisco's boundaries.

Control Of Transmission And Distribution Serving San Francisco. With the exception of public power services at Hunters Point and Treasure Island, PG&E owns and operates the electric distribution infrastructure system within San Francisco. With the exception of TransBay Cable, PG&E also owns all of the high-voltage transmission lines entering the City. As a result, the City's efforts to ensure that existing and new transmission and distribution infrastructure is sufficient to support renewable and GHG-free resources will either need to focus on influencing the procurement choices of these entirites or by increasing direct City control of this infrastructure.

State And Federal Regulation. PG&E, TransBay Cable and the direct access providers are subject to extensive regulation by the CPUC with respect to retail transactions and electricity distribution, and the Federal Energy Regulatory Commission (FERC) with respect to applicable wholesale transactions and electricity transmission. These state and federal regulations pre-empt San Francisco from regulating most terms and conditions for electric service by PG&E, TransBay Cable and direct access providers. They also determine the rules under which San Francisco can use PG&E's distribution system and the transmission system serving San Francisco.

Incorporating these constraints, the 2011 Updated ERP proposes the following three broad strategies to pursue additional GHG reductions.

The 2011 Updated ERP Incorporates The Guidance Of California's Energy Action Plan (Loading Order)

In 2003, the three then-leading California energy agencies[8] jointly adopted an Energy Action Plan (EAP) that outlined a blueprint to:

> Ensure that adequate, reliable, and reasonably-priced electrical power and natural gas supplies, including prudent reserves, are achieved and provided through policies, strategies, and actions that are cost-effective and environmentally sound for California's consumers and taxpayers.[9]

The EAP adopted a resource loading order that consists of first decreasing electricity demand by increasing energy efficiency and demand response, then meeting new generation needs first with renewable and distributed generation resources, and lastly with clean fossil-fueled generation. It also presented the challenges to aggressively pursuing the preferred loading order resources and suggested policy options to counter these challenges.

In 2008, San Francisco adopted the State's EAP and the same priority of loading order - energy efficiency and demand response first, then renewable resources and lastly clean burning fossil generation. However, as BoS Resolution 227-08 also noted, the State's Energy Action Plan "…also includes additional policies that the City may want to consider further before endorsing (e.g. evaluating so-called 'clean coal.')." Given the Board's suggestion to consider fully the State's Energy Action Plan and the City's vision to become GHG-free by 2030, it is prudent to revisit and revise the City's adopted loading order with an emphasis on GHG-free resources. This overarching recommendation fully supports the goal embodied in this 2011 Updated ERP and many recommendations outlined below - including policies for behind-the-meter options and wholesale energy procurement.

The 2011 Updated ERP Identifies New Strategies

1. Empowering San Francisco Citizens and Businesses to Reduce GHG-emissions (Ch. 4)

Given the limits on San Francisco's ability to directly regulate PG&E and the other electric service providers, the first strategy that the 2011 Updated ERP recommends is to take actions to empower San Francisco's own citizens, businesses and the City's own municipal facilities to take more control of their electricity usage. Increased investments in energy efficiency and on-site renewable (such as roof-top solar or low-emitting cogeneration) are two examples.

The recommendations listed in this report apply to all of San Francisco's residents, businesses and municipal buildings.

San Francisco not only has a strong ability to implement programs to encourage these activities but also the legal ability (through incentives, ordinances, and tax policies) to do many of these activities. An advantage of these customer-driven activities is that they fall into what are broadly called "behind-the-meter" programs that can be done largely without requiring extensive approval from either a customer's electric provider or state and federal regulatory authorities.

Behind-the-meter programs include such activities as:

- Reducing energy consumption through energy efficiency programs;

[8] These three energy agencies werethe California Power Authority (enacted with the inception of California's electricity deregulation but now defunct), the California Energy Commission and the California Public Utilities Commission.
[9] First Energy Action Plan, adopted by the CPA on April 18, 2003, the CEC on April 30, 2003, and the CPUC on May 8, 2003.

- Reducing peak energy usage through demand response and on-site storage;
- Generating electricity on-site from renewable energy sources such as rooftop solar, small urban wind or from low-GHG emitting on-site cogeneration; and
- Community-scale measures.

Energy Efficiency First. This 2011 Updated ERP strongly endorses energy efficiency efforts as the best approach for San Francisco to pursue. The report strongly recommends that San Francisco's energy efficiency programs continue and be expanded if possible. As RMI noted in its report prepared for this update:

> It cannot be emphasized too strongly that continued and increased emphasis on energy efficiency is the least expensive lever to reduce San Francisco's GHG footprint. While accessing that opportunity is more complex than building or acquiring generation, it is well worth the effort and can dramatically help reduce system costs.[10]

- Since its inception in July 2008, the GoSolarSF Program has created 71 jobs and installed over 4 MW of rooftop solar.
- The Sunset Reservoir Solar Project created over 70 jobs and increased the City's solar generating capacity by 5 MW.

As explained above, the State's Loading Order (and now also the City's adopted resource policy) puts energy efficiency at the top of the priority list of resources. Additionally, in 2005, the State adopted Senate Bill (SB) 1037 further reinforcing the need to identify all achievable, cost-effective energy efficiency savings, and requires all utilities, including municipal utilities, to first meet unmet resource needs with as much energy efficiency as possible.

Local Jobs and Economic Benefits. An advantage of these local, behind-the-meter activities is that they promote local economic development and job creation. Many of the technologies that would be used to achieve this goal, such as energy efficiency and combined heat and power (CHP), could also save customers money by reducing their overall energy costs over the life of the project, although up-front costs can be higher.

Cost Concerns. A potential down-side, as noted in the RMI report, is that some of these local technologies, particularly roof-top solar and small-scale wind, are currently significantly more expensive than other energy resources and are thus not likely to constitute a significant part of San Francisco's resource mix unless their costs drop and/or extensive rebates and subsidies can be identified to promote their development.

Program Opportunities. As detailed later in this report, many mechanisms already exist at the City level to implement these programs and many are specifically targeted to help overcome potential cost concerns. Increased use of behind-the-meter activities can be achieved through the use of incentives, long-term financing opportunities, educational/outreach programs, and changes to San Francisco's building codes.

Community Choice Aggregation as a Catalyst. Implementation of Community Choice Aggregation (CCA) (Recommendation #7) can help drive, facilitate and implement these customer-based initiatives. Implementation of a San Francisco CCA will increase local control and influence over deployment of local renewable energy and energy efficiency resources. Further, revenue streams from CCA customers can be leveraged to facilitate financing for the initial capital investments required for both local renewable projects and local energy efficiency programs. Such projects will promote for San Francisco's local industry to create jobs and further incubate emerging technologies in renewable energy generation and energy efficiency.

The set of recommendations that fall within this strategy are listed below.

[10] RMI Draft Report, p. ES-14.

EMPOWERING SAN FRANCISCO CITIZENS AND BUSINESSES

Recommendations

1. Improve and expand energy efficiency programs in San Francisco.
2. Promote the development of behind-the-meter resources to create jobs and encourage the optimal combination of energy efficiency, on-site generation (e.g. on-site wind or solar as well as efficient, low-emitting cogeneration) and load-shifting and demand response capability through smart-grid technology and energy storage.
3. Develop San Francisco as a "Green Test Bed" to promote and encourage the deployment of new energy technologies within the City and attract green energy firms to locate within the City, including finding alternate or new financing opportunities.
4. Improve building codes and standards to promote energy efficiency.
5. Advance and support Community Scale Energy Systems, both privately-owned as part of new development and through increased use of City-provided infrastructure where possible.
6. Promote back-up storage deployment as an alternative to the existing use of diesel and natural gas-powered back-up generation.
7. Implement Community Choice Aggregation consistent with guidance from the Board of Supervisors and the San Francisco Local Agency Formation Commission (LAFCo).

2. Increasing the renewable and GHG-free content of San Francisco's Electricity Supplies (Ch. 5)

As described above, San Francisco directly controls only about 17% of the City's electricity supplies, while the remainder is controlled by PG&E and other suppliers. Absent increased means to influence and affect the procurement choices of PG&E and other third party providers, it will be difficult for San Francisco to meet its goal of a zero-GHG electric system by 2030. Resource scenarios run by RMI, for example, estimated that about 90% of the energy resources needed to meet a zero-GHG electric system by 2030 will come from outside San Francisco.

Fortunately, on-going efforts at the state level have significantly increased the percent of renewable energy that these entities will need to include in their deliveries to San Francisco. Recently the California Air Resources Board (CARB) approved adoption of regulations that create a Renewable Electricity Standard (RES). The RES regulations, as approved, will expand the existing Renewable Portfolio Standard such that PG&E and other energy service providers will be required to source 33% of their energy sales by 2020 from renewable resources classified as "RPS-eligible."[11]

The SFPUC is already well-positioned to be the largest utility in California to achieve a zero-GHG electric system using Hetch Hetchy generation as well as renewable resources like the recently-completed 5 MW solar facility at the Sunset Reservoir to serve the City's municipal loads.

[11] RPS-eligible renewable resources are defined by the State law to include solar, wind, geothermal, biomass, and small-scale hydroelectric generation.

San Francisco can directly control more of its electricity supplies (both locally and regionally) through the formation of a CCA. CCA offers an opportunity for San Francisco to provide electricity supplies directly to customers that are currently served by PG&E and other third party suppliers, so that San Francisco would have direct responsibility and control over the GHG and renewable content of those supplies. Towards that end, San Francisco has created its CCA Program - CleanPowerSF. The goal of CleanPowerSF is that 51% of the energy supplied to its customers will be from renewable resources (including energy efficiency resources) by 2021. CleanPowerSF offers customers a choice - but not a requirement - to purchase electricity from its supply portfolio. A well-structured CleanPowerSF program that results in wide participation could serve as a significant component of GHG reductions as compared to continued reliance on PG&E and third party suppliers. At the same time, CleanPowerSF will be competing against PG&E and other ESPs for customers. To maximize participation in the program and the program's impact on the City's electricity supply portfolio, the program will need to balance numerous trade-offs in terms of costs, renewable and GHG content, price stability for its customers, and other factors.

Further, San Francisco is also studying the construction of a City-owned transmission line that would finally connect from San Francisco to the City's Hetch Hetchy electric generation and provide improved access to renewable resources outside the City.

Finally, San Francisco should continue to actively intervene in appropriate regulatory proceedings to ensure that PG&E and other energy service providers maximize their use of zero-GHG energy.

INCREASING THE RENEWABLE AND GHG-FREE CONTENT OF SAN FRANCISCO'S ELECTRICITY SUPPLIES

Recommendations

7. Implement CCA to offer more renewable and GHG-free electric supplies to San Francisco residents and businesses, consistent with guidance from the Board of Supervisors and LAFCo.

8. Evaluate and develop new City-owned transmission projects to increase the delivery of Hetch Hetchy and renewable power to San Francisco.

9. Develop an optional "green pricing" option (through CCA and/or PG&E) allowing San Francisco customers to voluntarily commit to purchase electric energy from zero-GHG energy sources.

10. Participate in regulatory proceedings before the CPUC and FERC to encourage state and federal policies to promote the use of GHG reduction strategies and encourage the development of CCA.

3. Continuing and expanding SFPUC electric service to guarantee reliable, reasonably-priced, and environmentally sensitive service. (Ch. 6)

Regardless of the energy policies adopted by San Francisco, the SFPUC will remain responsible for providing electric service to the City's municipal facilities. The following recommendations ensure that the SFPUC continues to provide reliable, reasonably-priced, and environmentally sensitive electric service to its customers.

CONTINUING AND EXPANDING SFPUC ELECTRIC SERVICE

Recommendations

11. Develop a rate structure for the SFPUC that reflects its cost-of-service, promotes the efficient use of electricity, and provides the SFPUC with the financial capability to use long-term financing to develop new resources.

12. Increase the use of municipal load supplied by electric energy from Hetch Hetchy to displace fossil-fuel use (e.g. shoreside docking, electric buses and light-rail vehicles, and recharging electric vehicles in City-owned parking lots).

13. Renegotiate the Interconnection Agreement (IA) with PG&E that governs the transmission and distribution of Hetch Hetchy energy to San Francisco that expires in June 2015.

14. Continue to implement the SFPUC's recently adopted Environmental Justice and Community Benefits policies.

Funding Concerns

Critical to achieving the goals of the 2011 Updated ERP is identifying funding sources to meet the goals of this plan - particularly given the City's current financial condition. Accordingly, a wide range of funding alternatives, including both public and private sector options, will need to be exploited to fully realize the City's goals.

The 2011 Updated ERP Reaffirms The On-Going Goals Of The 2002 ERP

Although much of the focus of this report is on achieving San Francisco's GHG reduction targets, the 2011 Updated ERP also reaffirms San Francisco's commitment to the goals contained in the 2002 ERP.

ELECTRICITY RESOURCE PLAN GOALS

- Assure Reliable Power
- Maximize Energy Efficiency
- Develop Renewable Power
- Increase Local Control
- Affordable Electric Bills
- Improve Air Quality
- Support Environmental Justice
- Promote Economic Opportunities

Next Steps

This 2011 Update ERP, similar to the original 2002 ERP, should be considered a living document, identified broad goals for San Francisco to reduce greenhouse gas emissions and discussing opportunities for achieving those goals. For each of the recommendations outlined, significant work remains to be done in order to achieve San Francisco's goal of zero-GHG emissions.

For each identified recommendation, potential concerns that would affect implementation are highlighted, the need for changes to City Ordinances, potential funding sources are identified, and possible next steps are identified. For each of the broad recommendations contained in this report, references back to the relevant corresponding recommendations contained in the RMI draft report, San Francisco's Climate Action Plan, and the Peak Oil Task Force Report are noted.

Finally, it should be noted that this 2011 Updated ERP is only a guideline that lays out a vision of how San Francisco's energy future could evolve. Prior to recommendation of any particular project, activity or action additional study will be required and additional approvals will be sought as necessary. No project, activity, or action will be undertaken prior to adequate environmental review and complete compliance with the California Environmental Quality Act (CEQA) and the City's Environmental Quality Regulations.

The following tables identify possible next steps that could be undertaken over the next two years for each of the recommendations.

As a result of the 2002 ERP and related efforts, San Francisco already has on-going programs underway that are beginning to address, and implement, many of the recommendations contained in this report. Together, they represent a timeline for implementation of this 2011 Updated ERP over the next two years. The implementation of these steps will help the City realize its ultimate goal - a GHG-free electric system.

Prior to recommendation of any particular project, activity or action additional study will be required and additional approvals will be sought as necessary. No project, activity, or action will be undertaken prior to adequate environmental review and complete compliance with the California Environmental Quality Act (CEQA) and the City's Environmental Quality Regulations.

Timeline for Recommendations

Legend			
CIP	Capital Improvement Plan	OEWD	Mayor's Office of Economic and Workforce Development
CPUC	California Public Utilities Commission	PGC	Public Goods Charge
DG	Distributed Generation	SFE	San Francisco Department of the Environment
DPW	Department of Public Works	SFHA	San Francisco Housing Authority
EE	Energy Efficiency	TIDA	Treasure Island Development Authority
EV	Electric Vehicle		

Recommendation	2011 1st half	2011 2nd half	2012 1st half	2012 2nd half
1. Improve and expand Energy Efficiency programs.	GreenFinanceSF – Work with appropriate City Departments and Stakeholders to resolve issues mortgage lenders have with PACE funding to allow start of program.	Propose/pass clarifying legislation if necessary.		
	PGC - Determine City policy on changing structure of PGC programs to give management to third party and/or City and CCA for administration.	Advocate for a change in the administration of PGC funds, develop coalition to support legislative change, and participate in legislative process to change legislation.	If legislation is successful, participate in necessary proceedings at CPUC to transfer program management.	
	TransBay Cable Funds - Work with SFE, DPH, Power Plant Task Force, OEWD to determine use and allocation of SF Electric Reliability Payments ($2 million/year).	Bring proposal for use of funds to Board for approval.	Ongoing: Expend funds as determined by Board.	
	Split Incentives - Determine structural changes required to address splint incentive issues.	Advocate for split incentive structural changes, participate in legislative process to change legislation.		
	SFPUC ongoing EE funding for City facilities ($16 million for the next 10 years).		SFPUC ongoing EE funding for City facilities ($16 million for the next 10 years).	

Recommendation	2011 1st half	2011 2nd half	2012 1st half	2012 2nd half
2. Promote the development of behind-the-meter resources.	Ongoing: SFPUC to continue funding of GoSolarSF program ($15 million through fiscal year 2017-2018).		Ongoing: SFPUC to continue funding of GoSolarSF program ($15 million through fiscal year 2017-2018).	
	Work with appropriate City Departments and Stakeholders to identify available funding sources for distributed generation from state programs.	Determine portion of SF Electric Reliability Payment funds allocated to renewable energy (see also Recommendation #1). Evaluate how best to educate potential DG customers to utilize available DG programs. Evaluate any changes to City ordinances to promote DG. Work with appropriate City Departments and Stakeholders to evaluate the feasibility of potential partnerships with NRG.	Ongoing: Outreach and education efforts. Propose/change building codes/ordinances as appropriate.	
	Ongoing: Work with PG&E on interconnection needs.		Ongoing: Work with PG&E on interconnection needs.	
	Develop proposal for deployment of CHP.			
3. Develop San Francisco as a "Green Test Bed".	Ongoing: Work with PG&E on interconnection needs		Ongoing: Work with PG&E on interconnection needs	
	Identify scope of Green Test Bed and develop program criteria for inclusion into Test Bed.	If targeted area, work with other City departments (e.g. SFHA, TIDA, Port, Redevelopment Agency).	Develop agency responsibilities for coordination and /management.	Ongoing: Continue to identify new opportunities.
	Draft Ordinance to streamline permitting process; work with OEWD/SFE to identify City incentives; work with Planning, SFE, DPW.	Introduce Ordinance to Board for approval.		
	Identify external funding sources and potential partnerships.	Contact/negotiate w/partners.	Begin partnership.	

Recommendation	2011 1st half	2011 2nd half	2012 1st half	2012 2nd half
4. Advance and support Community Scale Energy Systems.	Develop behind-the-meter strategies for Hunters Point (EE and DG).	Identify potential sites and cost-effectiveness of policy. Implement behind-the-meter strategies for Hunters Point.	Begin process to develop Ordinance to create Community Scale Energy Systems.	Implement Ordinance.
	Propose amendments to SF Admin Code to make SFPUC default provider.			
	Ongoing: Work with PG&E on interconnection needs.		Ongoing: Work with PG&E on interconnection needs.	
5. Improve Building Standards.	New building standards opted for major new construction.	Evaluation of retrofit standards for existing buildings.		
	Ongoing: Urban Wind Task Force.			
	EV charging station infrastructure.			
6. Promote back-up storage deployment.	Monitor CPUC proceedings.		Based on results of CPUC proceedings, determine next steps.	
7. Implement Community Choice Aggregation.	Negotiate term sheet with supplier, finalize supplier contract language, seek approval from SFPUC and BoS on supplier contract and develop opt-out and marketing information.		Process opt-out notices and begin serving CCA customers.	
	Work with stakeholders to develop RFP for new renewable and green technology resources, report to SFPUC by July 2011 and issue RFP for new generation resources.		Evaluate RFP responses and begin roll-out of new resources to match customer phasing and portfolio requirements.	
8. Evaluate and develop City-owned transmission.	Work with consultants to evaluate cost, feasibility, routing issues; evaluating financing options and partnership opportunities; and monitor ongoing CAISO Transmission Planning Process.		CPUC expected to reach decision point on cost/feasibility of proposed projects.	Proceed with appropriate next steps of permitting, environmental review if decision is to proceed.
9. Develop optional green pricing.	Proposals for PG&E and CCA customers.	Advocate for Green Pricing Option at CPUC.		
10. Participate in policy-setting and regulatory proceedings.	Ongoing: Continue to participate in regulatory forums for all aspects of policy decisions that support these recommendations.		Ongoing: Continue to participate in regulatory forums for all aspects of policy decisions that support these recommendations.	
	Relook and revisit SF's Loading Order with emphasis on GHG reduction goal.	Propose and advocate for City GHG-free Loading Order.		

Recommendation	2011 1st half	2011 2nd half	2012 1st half	2012 2nd half
11. Develop a rate structure for the SFPUC Power Enterprise	Rate structure approved by SFPUC.	Identify and resolve rating agency concerns.		Obtain credit rating.
12. Increase use of municipal load to displace fossil-fuel use.	Coordinate with EV Task Force.			
	Identify additional opportunities as appropriate.			
13. Renegotiate the Interconnection Agreement.	Begin identifying options and strategies and cost-benefit analysis of those options. Determine allocation of TransBay Cable funds allocated to OEWD.			
14. Continue to implement Environmental Justice and Community Benefits policies.	Community Benefits Policy adopted.	Work with OEWD to determine allocation of SF Electric Reliability funds to green job training programs.		

List of Abbreviations

BAAQMD	Bay Area Air Quality Management District
BoS	Board of Supervisors
CAISO	California Independent System Operator
CARB	California Air Resources Board
CCA	Community Choice Aggregation
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CHP	Combined Heat and Power
CIP	Capital Improvement Plan
CPUC	California Public Utilities Commission
CSI	California Solar Initiative
DG	Distributed Generation
DR	Demand Response
EAP	Energy Action Plan
EE	Energy Efficiency
EM&V	Evaluation, Measurement and Verification
ESP	Energy Service Provider
ET	Electrified Transport
EV	Electric Vehicle
FERC	Federal Energy Regulatory Commission
FIT	Feed-In Tariff
GHG	Greenhouse Gas
GW	gigawatt
GWh	gigawatt-hour

HHWP	Hetch Hetchy Water and Power
IA	Interconnection Agreement
IOU	Investor-Owned Utility
LAFCo	Local Agency Formation Commission
LED	Light Emitting Diode
LSE	Load Serving Entity
LCOE	Levelized Cost of Energy
MID	Modesto Irrigation District
MW	megawatt
MWh	MegaWatt-hour
PACE	Property Assessment Clean Energy
PG&E	Pacific Gas & Electric Company
PGC	Public Goods Charge
PPA	Power Purchase Agreement
PV	Photovoltaic
REC	Renewable Energy Credit
RES	Renewable Electricity Standard
RFO	Request For Offers
RFP	Request For Proposals
RMI	Rocky Mountain Institute
RPS	Renewable Portfolio Standard
SFE	San Francisco Department of the Environment
SFO	San Francisco International Airport
SFPUC	San Francisco Public Utilities Commission
SMUD	Sacramento Municipal Utility District

TID	Turlock Irrigation District
TOU	Time-of-Use
WAPA	Western Area Power Authority
WDT	Wholesale Distribution Tariff

TERMINOLOGY

ZERO GHG RESOURCES generate electric energy without directly releasing greenhouse gases. Both RMI's and the CARB's definition of zero-GHG resources includes power from solar, wind, geothermal, biomass, hydroelectric and nuclear sources. However, for purposes of this study, it is assumed that the use of power from large hydroelectric and nuclear is limited to generation from existing sources.

GHG REDUCING TECHNOLOGIES improve the efficient use of fossil fuels and thus reduce their overall usage and associated GHG emissions. Cogeneration, where it is more efficient to generate electric energy and thermal heat (e.g. steam and/or hot water) at the same time rather than have this performed as two separate processes is an example of a GHG reducing technology. Electric vehicles (EVs) are another example. Even though there may be GHG emissions associated with the electric energy needed to power the EV, these GHG emissions are significantly less than the GHG emissions from the automobile that is being replaced by the EV.

CHAPTER 1

CHANGES SINCE THE 2002 ERP

THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
A Department of the City and County of San Francisco, California

CHAPTER 1 - CHANGES SINCE THE 2002 ERP

The original 2002 ERP was a bold initiative for San Francisco to control its energy destiny and shape the future use of energy within the city. This chapter identifies how California's and San Francisco's energy system have changed since 2002, as well as the accomplishments of the 2002 ERP.

The Legacy Power Plants Will Be Closed

A major impetus for the 2002 ERP was the desire to close the Hunters Point and Potrero Power Plants. In 2002, all of the electric transmission lines serving San Francisco ran up the Peninsula, creating transmission constraints that required these two power plants to remain in operation to maintain reliable electric service within San Francisco. As the 2002 ERP stated:

> Both of the[se] power plants…are older, relatively inefficient fossil-fueled power plants. Both plants are also located within the Southeastern portion of San Francisco, an area subject to abnormally high rates of asthma and other environmental problems.

As a result of actions taken pursuant to the 2002 ERP, the Hunters Point Power Plant shut down in May 2006 and the Potrero Power Plant was shut down in February 2011.

The 2002 Electricity Resource Plan has achieved its goal of shutting down San Francisco's legacy power plants at Hunters Point and Potrero and has spurred significant investments in transmission, renewable energy, and energy efficiency programs.

The 2002 ERP provided the framework for the City to work with the CAISO to identify the transmission upgrades[12] that, once completed, allowed for the Hunters Point Power Plant to be shut down in 2006. Pursuant to a 1998 agreement with the City, PG&E has dismantled the plant and is restoring the site for other uses, including potential residential development.

The Potrero Power Plant was shut down after the $505 million[13] TransBay Cable began commercial operation. The TransBay Cable is a 53-mile high-voltage direct-current transmission line that runs underneath the San Francisco Bay from a substation located in the City of Pittsburg to the Potrero substation in San Francisco. The TransBay Cable increases the ability to deliver power into San Francisco by 400 MW, equal to about 40% of San Francisco's peak electric usage of 970 MW. Prior to TransBay Cable commencing operation, the CAISO had determined that the Potrero Power Plant needed to remain in operation in order to ensure reliable electric service to San Francisco. With the closure of the Potrero Power Plant, the site will be remediated and ultimately redeveloped in addition to the redevelopment of the adjacent Pier 70.

[12] In order to close the Hunters Point Power Plant, the 2002 ERP set a goal of adding 100 MW of new transmission capacity by 2005 and an additional 350 MW of capacity by 2006. This was achieved through:

- A planned upgrade from 60 kV to 115 kV of the sixth overhead transmission line running from the San Mateo to the Martin substation (the other five overhead transmission lines were already at 115 kV), which was completed in 2005; and
- The construction of the 230 kV Jefferson-Martin underground transmission line that runs from PG&E's Jefferson substation (near Redwood City) to the Martin substation (completed in 2006).

[13] This is the cost reported by TransBay Cable in their filing before FERC to recover, through electric rates paid by all transmission users of the CAISO. As of March 2011, FERC had not yet issued a decision as to how much of this cost is reasonable and should be recovered from ratepayers.

The 2002 ERP originally proposed that the SFPUC construct 200 MW of new in-city generation that would have allowed for the retirement of the Potrero Power Plant.[14] The SFPUC pursued this project (known as the San Francisco Energy Reliability Project or more informally as "the peakers") until the TransBay Cable project (along with other transmission system improvements) was identified as an alternative approach to closing the Potrero Power Plant while maintaining reliability.

The TransBay Cable project was not part of the 2002 ERP but was identified as part of an on-going stakeholder process, begun by the CAISO in response to the 2002 ERP, to develop long-term solutions to the reliability of San Francisco's electric system.

San Francisco's Energy Goals As Outlined In The 2002 ERP Have Not Changed

After extensive public discussion, the 2002 ERP adopted eight broad goals for San Francisco's energy policy in addition to its goal of closing the Hunters Point and Potrero Power Plants.

Although each of these goals represent important on-going commitments (such as supporting environmental justice), the relative importance of some of these goals has changed since the time of the original 2002 ERP. When San Francisco prepared the 2002 ERP, for example, reliable service was a major concern. San Francisco was facing rolling blackouts in the midst of the California energy crisis, and PG&E, the major provider of electric service to San Francisco, was in bankruptcy.

SAN FRANCISCO'S ENERGY GOALS
(AS ENDORSED BY SAN FRANCISCO IN 2002)

2002 ELECTRICITY RESOURCE PLAN GOALS
• Assure Reliable Power • Maximize Energy Efficiency • Develop Renewable Power • Increase Local Control • Affordable Electric Bills • Improve Air Quality • Support Environmental Justice • Promote Economic Opportunities

Today, the significant investments in new transmission projects, such as the TransBay Cable and various PG&E upgrades, have created a much more robust transmission system. However, PG&E's aging in-city distribution system continues to create local reliability problems at the distribution level.

[14] In late 2002, San Francisco obtained four gas-fired combustion turbine generators (along with funds to develop the facilities) through a legal settlement with Williams Companies, Inc. to resolve complaints about market manipulation during the California energy crisis.

The new investments in transmission infrastructure, along with in-City demand reduction and supply resources precludes the need for any large-scale, central generation to be built in the City in the foreseeable future.[15] As discussed in Recommendation #8, the SFPUC is studying additional transmission projects to the City (as directed by BoS Resolutions 414-07 and 299-08) to ensure that over the longer-term there will continue to be no need for large-scale generation within the City. The SFPUC is also examining, as is PG&E, potential upgrades to further improve the reliability of the higher voltage (230 kV) transmission system that serves downtown San Francisco.

State And Local Actions Since 2001 Have Promoted Energy Efficiency And Renewable Energy Development To Reduce Greenhouse Gas Emissions

In many ways, the 2002 ERP could be considered prescient and ahead of its time. The 2002 ERP advocated reducing greenhouse gases, developing renewable energy, and promoting energy efficiency. Many of these same goals have subsequently been adopted by the State of California, albeit not until several years later. Perhaps the most important change since the 2002 ERP has been California's groundbreaking commitment to develop renewable power and energy efficiency as the cornerstone of the state's energy policy and the state's efforts to reduce GHG emissions.

In 2002, California adopted, via legislation, the Renewables Portfolio Standard that requires utilities and ESPs to meet at least 20% of their energy needs by 2012[16] from renewable energy sources other than large hydroelectric sources (also known as RPS-eligible resources). In September 2010 the CARB established a Renewable Electricity Standard (RES)[17] that increased this requirement to 33% by 2020.[18]

The CARB's RES allows the SFPUC to meet all of its energy needs that are not met by its existing GHG-free Hetch Hetchy power with RPS-eligible renewable resources. This will make San Francisco the largest public utility in the state to have zero-GHG emissions for its electric generation.

In 2006, with the passage of AB32, California's Global Warming Solutions Act, California has now committed to reducing its GHG emissions to 1990 levels by the year 2020. This will require approximately a 25% reduction from current levels. This goal is similar to, although not as strict as, San Francisco's Climate Action Goals adopted in 2002.

Finally, and most recently in 2008, the San Francisco BoS directed that San Francisco should develop a plan to achieve the goal of San Francisco

> With the passage of ordinance 81-08, the Board of Supervisors laid out a clear path for San Francisco's energy future, requiring that the city **"…develop a plan to achieve the goal of San Francisco becoming fossil fuel free by 2030."**

[15] An additional concern at the time of the 2002 ERP was Mirant's proposal in 2000 to re-power the Potrero Power Plant by constructing a new and larger (540 MW) plant at the existing site. Extensive opposition to this proposal, both from San Francisco's elected leaders as well as neighborhood groups, resulted in Mirant canceling its proposal in 2003.

[16] The legislation adopted a 2010 compliance target for achieving the 20% goal but allowed additional time for utilities to make up any shortfalls from previous years - essentially creating a 2013 compliance deadline. Legislation currently being proposed would establish 2013 as the date to achieve the 20% compliance.

[17] Since both the CARB's RES program and the RPS program have similar goals and mechanisms, for ease of reference "RPS-eligible" resources will include resources eligible under both the RES and RPS programs.

[18] CARB implemented its RES standard under its regulatory authority in response to an Executive Order issued by Governor Arnold Schwarzenegger after vetoing AB64/SB14, two pieces of legislation that would have expanded the state's existing RPS from 20% to 33%. SB722, which also would have established a 33% RPS failed to clear the Legislature prior to the end of the last session in August 2010 but has been reintroduced as SB23 in the new regular legislative session, and as SBX1-2 in the special session recently convened to address California's budget issues.

becoming fossil fuel free by 2030,[19] again establishing a policy agenda and environmental goals for the City that are well ahead of both California and the nation. This 2011 Updated ERP contains recommendations to move San Francisco toward its vision for greenhouse gas-free electricity by 2030.

San Francisco Has Made Substantial Progress In Achieving The Goals Set Forth In The 2002 ERP

Since the 2002 ERP, San Francisco has made substantial progress on the goals set forth in the plan. The SFPUC has installed over 7 MW of new solar photovoltaic (PV) generation on municipal facilities both within San Francisco and at the Airport. This includes the 5 MW Sunset Reservoir PV facility that came on-line in 2011.

In 2006, California also adopted the California Solar Initiative (CSI), providing $2.8 billion in incentives between 2007 and 2016 to spur the installation of 3,000 MW of rooftop solar installations. To complement this program, San Francisco adopted its GoSolarSF program, operated by the SFPUC, which provides additional incentives to San Francisco residents and businesses to install rooftop solar.[20] This program is funded through 2018 at the rate of $2 to $5 million per year.

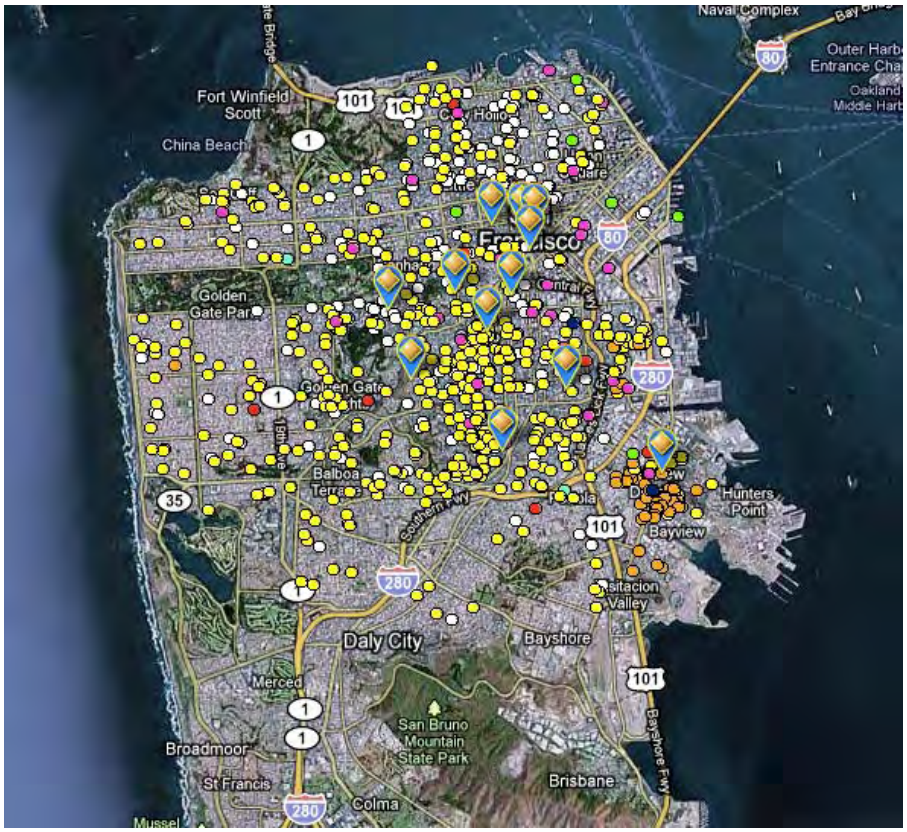
As a result of these combined incentives, San Franciscans have actively installed roof-top solar photovoltaic (PV) projects, most of them taking advantage of the rebates available at the state level through the state's CSI, as well as supplemental payments from the SFPUC's GoSolarSF program. To date, the GoSolarSF Program has created 71 jobs and has installed, or committed to be installed, 5.51 MW. In total, San Francisco has installed over 13 MW of solar photovoltaic capacity since the 2002 ERP.

Table 1
SOLAR PHOTOVOLTAIC INSTALLATIONS BY SFPUC

Generator Plant	Size (kW)	Cost ($) Millions[21]	Date in Service
OWNED BY SAN FRANCISCO			
Moscone	675	4.7	Oct 2003
Southeast	255	1.9	Oct 2005
Pier 96	245	2.3	Jan 2007
CDD	134	1.9	Dec 2007
North Point	241	2	Dec 2007
Maxine Hall	32	0.35	Dec 2007
China Town	10	0.15	Dec 2007
San Francisco International Airport	492	5.5	Feb 2008
Sub-Total - owned	**2,084**	**$18.8**	
UNDER LONG-TERM CONTRACT			
Sunset Reservoir[22]	5,000	23.5 ¢/kWh	1st Qtr. 2011
Total	**7,084**		

[19] BoS Ordinance 81-08.
[20] GoSolarSF provide incentives between $2,000 and $10,750 for residents and up to $10,000 for businesses to install solar on local rooftops. Higher incentives are given to low income households and to those living in areas historically impacted by pollution. In order to participate in the program, installation companies must offer green jobs to disadvantaged residents. The program provides up to $60,000 for affordable housing providers.
[21] Costs shown include available rebates.
[22] Generation from the Sunset Reservoir PV project is purchased by the SFPUC under a long-term Power Purchase Agreement (PPA) at an initial price of 23.5 ¢/KWh escalated for inflation.

Figure 2
SOLAR PHOTOVOLTAIC INSTALLATIONS IN SAN FRANCISCO BY SAN FRANCISCO RESIDENTS AND BUSINESSES



SOURCE: SF Solar Map (www.sf.solarmap.org)

The 2002 ERP also advocated for the increased use of Combined Heat and Power (CHP), also known as cogeneration. Cogeneration units generate both electricity (either for use on-site or to be sold to others) with the waste heat produced by the generator then being used typically to heat the facility, generate steam, or provide hot water. Although not a renewable energy source, as cogeneration almost always consumes fossil fuels, the combined use of the fuel for both electric generation and heating purposes results in a highly-efficient system and reduces the use of fossil-fuels (such as natural gas) that would otherwise be needed for heating.

San Francisco currently has over 27 CHP installations with a total capacity of 60 MW. One half of this capacity is located at the San Francisco International airport. Between 2003 and 2007 almost 7 MW of new cogeneration capacity has been built in San Francisco, or approximately 1.5 MW per year.[23]

Energy Efficiency Programs Have Also Been Reinvigorated

Along with the State of California's enhanced commitment to renewable energy, the State has also made a corresponding commitment to maximizing the use of energy efficiency, as explained in the Loading Order section in the Executive Summary.

[23] Perea, Philip M. 2007. An Assessment of Cogeneration for City of San Francisco. Prepared for Department of Environment and City and County of San Francisco. June. Table 2. Cogeneration Facilities in San Francisco.

The SFPUC, through the Sustainable Energy Account[24] sets aside at least 5% of gross revenues from Hetch Hetchy power sales to fund energy efficiency and renewable energy projects for municipal facilities. Over the past five years, the SFPUC has spent over $35 million on energy efficiency projects at 140 locations.

PG&E estimates it now spends $25 million per year in San Francisco on energy efficiency resulting in estimated peak demand reduction of 10 MW/yr. Some of this funding is provided to SFE to fund energy efficiency programs such as San Francisco's Energy Watch, which has provided over 4,000 energy audits and energy efficiency measures to small businesses, resulting in an estimated demand reduction of 4 MW.

Overall, these significant investments in energy efficiency have been successful in reducing energy usage. Peak electric demand in 2012 is forecasted by RMI to be slightly over 1,000 MW, almost 15% less than the 1,145 MW forecasted in the 2002 ERP.[25]

SFPUC has developed a long-term plan of energy efficiency improvements and projects that has been budgeted as part of the SFPUC's 10-year Capital Improvement Program (CIP) at $15 million over the next ten years. In addition, the 10-year CIP also includes $16 million over the next two years (FY2011-12 and FY2012-2013) to convert three quarters of San Francisco's street light fixtures (18,000 out of 24,000) to more energy-efficient and longer-lasting light-emitting diode (LED) lighting that will be combined with a smart controller system to optimize their operation.

To further improve energy efficiency, San Francisco has revised its building codes to require all new construction in San Francisco to meet increasingly stricter "green building" standards that minimize energy usage and encourage the use of renewable power. The new standards will require all new buildings in San Francisco to meet and exceed California's existing energy standards[26] by 15%, regardless of size or occupancy, as well as require larger commercial buildings to meet 1% of their energy needs from renewable power. These standards apply to residential, commercial and municipal buildings.

[24] This account was previously called the Mayor's Energy Conservation Account (MECA).
[25] RMI draft report, p. 24; 2002 ERP, p. 30.
[26] Known as Title 24 and established by the California Energy Commission.

2002 ELECTRICITY RESOURCE PLAN
MAJOR ACCOMPLISHMENTS

Closing the Legacy Plants

- Hunters Point Power Plant closed in May 2006.
- Mirant's Potrero Power Plant closed in February 2011.

Renewable Energy and Energy Efficiency

- SFPUC has developed over 7 MW of solar projects on City facilities.
- Over 2,000 residents and businesses will have installed over 8 MW of solar PV, many of which have taken advantage of incentives provided by the SFPUC's GoSolarSF program.
- Significant reduction in energy usage through enhanced energy efficiency.
- New building standards adopted to enhance energy efficiency.

Reliable Service

- Significant investments in new transmission projects such as TransBay Cable and various PG&E upgrades since 2002 have created a much more robust transmission system in San Francisco, even with the retirement of the Hunters Point and Potrero Power Plants.

Increasing Local Control

- SFPUC is pursuing the formation of its CCA, CleanPowerSF, with its Implementation Plan certified by the CPUC on May 18, 2010, and negotiations currently underway with potential CCA suppliers and service providers.
- SFPUC is providing distribution service within San Francisco at Hunters Point and Treasure Island, increasing San Francisco's control over its utility infrastructure.
- SFPUC is pursuing new transmission projects to ensure reliability and increase its access to renewable energy sources.

San Francisco Is Also Increasing Its Local Control Of Its Energy Future

One of the major goals of the 2002 ERP was to increase San Francisco's direct control over its energy future. One way to achieve this goal is through the formation of a CCA. AB117 (Migden), enacted in 2002, established the ability to create CCAs in California. Implementation of a CCA enables a city or local government to provide electricity supplies to its residents and businesses, while using the existing utility's transmission and distribution system to deliver those supplies. In doing so, the local government agency can directly control the make-up of the electric supplies that are provided, for example in terms of renewable and GHG content.

As a CCA, San Francisco would provide electricity supplies to all customers within San Francisco, other than those who chose to opt-out of the program and remain with either PG&E or another ESP. PG&E would continue to provide distribution and transmission service for the CCA program, transmitting the CCA's electricity supplies to CCA customers over PG&E's wires. The CCA customers would continue to pay for and receive energy efficiency services funded through the Public Goods Charges (PGC).

To increase local control over San Francisco's electricity supplies and to offer San Francisco residents and businesses the opportunity to purchase electricity supplies with high renewable and GHG-free content, San Francisco has created its own CCA program, CleanPowerSF, with its Implementation Plan certified by the CPUC on May 18, 2010. CleanPowerSF is currently in the process of identifying potential electricity suppliers and other service providers to support the program, and negotiating the necessary agreements.

One goal of CleanPowerSF is to offer a portfolio of energy resources that will be 51% renewable by 2021, significantly higher than the 33% that PG&E is expected to provide by that time. Additionally, CleanPowerSF plans to include locally-developed renewable, low GHG and GHG-free resources (including energy efficiency) in its supply portfolio where feasible and cost-effective, and in so doing should serve to directly encourage and facilitate development, financing and construction of local resources. At the same time, CleanPowerSF will be competing against PG&E and other ESPs for customers. To maximize participation in the program and the program's impact on the City's electricity supply portfolio, the program will need to balance numerous trade-offs in terms of costs, renewable and GHG content, price stability for its customers, and other factors (see further discussion of CCA program opportunities and constraints under Recommendation #7).

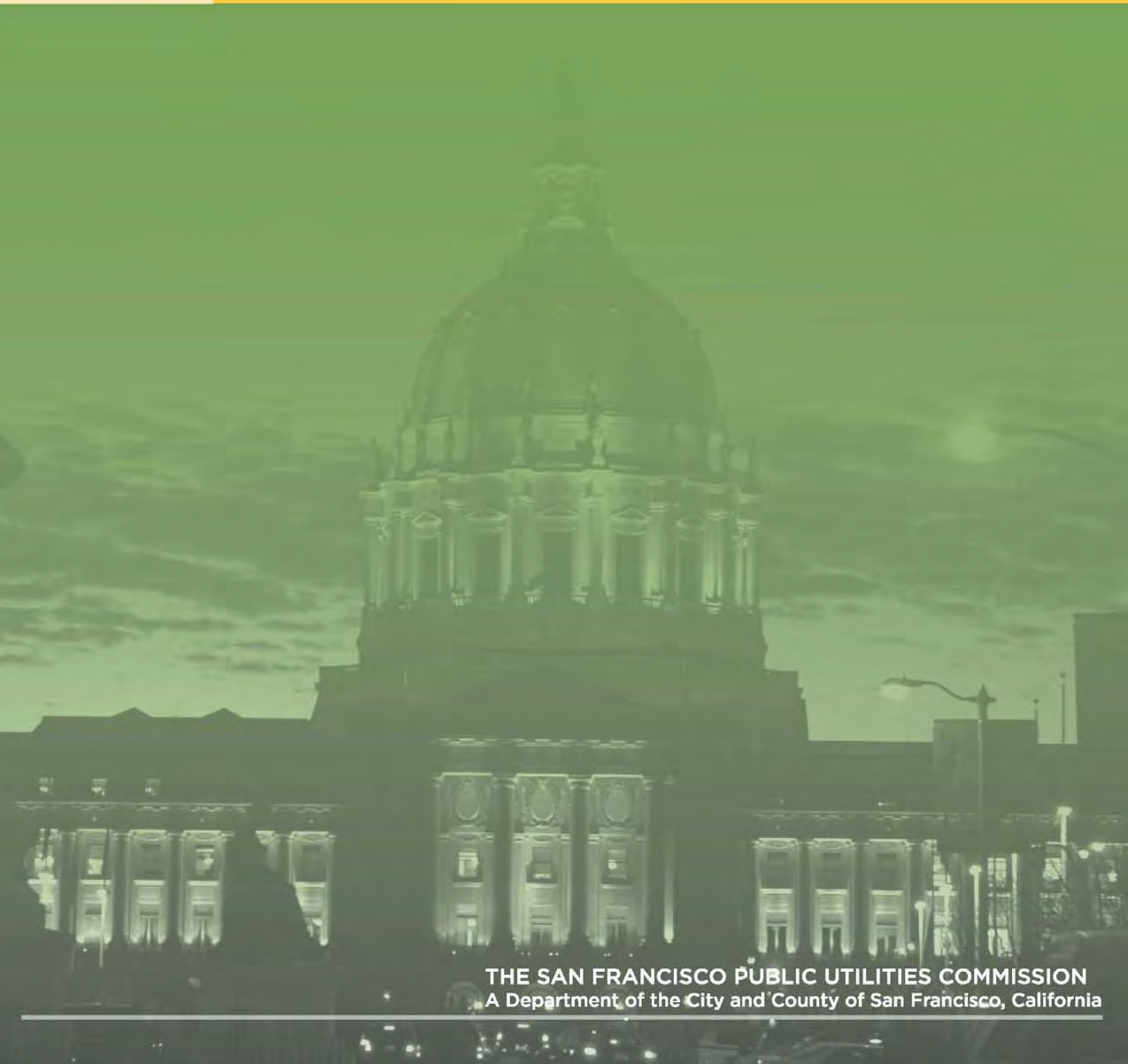
Another option for San Francisco to better control its energy future is to increase the amount of San Francisco's load that is served directly by the SFPUC. In 1999, the Board of Supervisors amended the San Francisco Administrative Code[27] to require the City to evaluate the provision of electric service to any new City developments, including military base reuse projects, redevelopment projects, and other City projects. In compliance with this directive, the SFPUC has become the provider of electric distribution services to both the Treasure Island and Hunters Point redevelopment projects. Both of these sites were previously military installations.

Finally, the SFPUC is also examining new City-owned transmission lines to assure delivery of its Hetch Hetchy generation to San Francisco and as a means to access large-scale regional renewable generation.

[27] The BoS Ordinance added Chapter 99, Public Power in new City Developments to the San Francisco Administrative Code.

CHAPTER 2

UPDATING THE 2002 ELECTRICITY RESOURCE PLAN



THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
A Department of the City and County of San Francisco, California

CHAPTER 2 - UPDATING THE 2002 ELECTRICITY RESOURCE PLAN

BoS Ordinance 94-09 urged the San Francisco Public Utilities Commission to update San Francisco's 2002 ERP. In developing these goals, the SFPUC was to consider the transmission and distribution needs of the City, energy resources (including energy efficiency and renewable generation) needed to meet the City's energy needs, evaluate cost-effective options to reduce greenhouse gas emissions from the electric sector, and identify how meeting these needs interacts with the City's existing workforce development initiatives. The ultimate goal of this 2011 Updated ERP is to outline a framework that will achieve San Francisco's vision for greenhouse gas free electricity.

ORDINANCE 94-09
Closing Potrero Power Plant and Updating the Electricity Resource Plan

The Board of Supervisors urges the PUC to produce, within six months of the effective date of this resolution Ordinance, an update to the Electricity Resource Plan. The process of updating the Electricity Resource Plan should include public outreach to citizens, businesses, and all potentially interested groups including the Power Plant Task Force. The update should identify the most effective and economic means of implementing the goals of this Ordinance over the short and long term, and shall consider, without limitation, the following:

(i) Transmission needs to transport Hetch Hetchy generation and cost-effective clean resources into the City, and alternatives for meeting those needs, including, construction of City-owned transmission lines, contracts or joint transmission projects with other municipalities, and participation in the ISO transmission markets; and
(ii) Transmission and distribution needs within the City to support reliability and facilitate distributed generation and renewables, including without limitation connections between substations and the 115 and 230 kV transmission systems within the City, and transmission and distribution needs to meet new City developments; and
(iii) Resources needed to meet municipal electric loads, Community Choice Aggregation loads, other potential City loads, and the City's resource adequacy capacity obligations, including (i) options to maximize cost-effective energy efficiency and demand-reduction, and local and remote renewable and clean resources, and (ii) an analysis of alternatives for use of renewable fuels, clean and flexible resources, and storage alternatives; and
(iv) Cost-effective options to reduce greenhouse gas emissions from the electricity sector and to offset greenhouse gas emissions from other sectors; and
(v) Participation in existing City workforce development initiatives with respect to jobs related to the operation, acquisition, reconstruction, replacement, expansion, repair, or improvement of energy facilities under the jurisdiction of the Public Utilities Commission; and
(vi) Specific projections of electric demand, conservation and energy efficiency achievements, and clean and renewable resource development, and
(vii) Recommendations for updated clean energy goals for the City.

The BoS's desire to update the 2002 ERP also provided the SFPUC the opportunity to examine the necessary steps to "…develop a plan to achieve the goal of San Francisco becoming fossil fuel free by 2030…" as requested by BoS Ordinance 81-08.

In response to the Board's request, the SFPUC undertook the actions identified below.

1. Incorporation of Guidance from Other City Ordinances and Policies

SFPUC staff included within this 2011 Updated ERP the requirements and guidance contained in other City ordinances and policies. This included San Francisco's adopted Climate Action Plan proposals as well as the recent recommendations of the Peak Oil Task Force.[28] For CCA, the report includes guidance given to the SFPUC by the BoS on implementing CCA and appropriate recommendations from the San Francisco LAFCo in their consultative role to the BoS.

2. Retaining Rocky Mountain Institute (RMI)

The SFPUC retained RMI, the author of the 2002 ERP, to develop electric resource scenarios to determine the feasibility of achieving a GHG-free electric system by 2030. RMI completed its draft report; "A Greenhouse Gas Free Electricity Strategy for City of San Francisco" in May 2010. RMI also assembled a number of recommended actions to help San Francisco achieve its goal. Many of these recommendations were based on discussions and interviews with San Francisco's energy stakeholders. RMI's recommendations are contained in Appendix 2 of this report.

3. Reviewing California Energy Policy and Other Studies

The SFPUC reviewed applicable state and federal energy policies and regulations for their effect on San Francisco. This included reviewing studies of renewable energy potential, energy efficiency estimates, and transmission line requirements developed by the CPUC, the CAISO and others.

4. Creation of a Green Technical Advisory Committee (Green TAC)

In conjunction with the Power Plant Task Force,[29] the SFPUC convened a Green Technical Advisory Committee (Green TAC) composed of experts from relevant green technologies (solar, wind, energy efficiency/demand response, CHP, and energy storage), experts in public policy and renewable energy financing, and members of the Power Plant Task Force. Appendix 3 lists the members of the Green TAC and their affiliations.[30] The Green TAC met four times between August and September and reviewed the draft RMI report. One of the main purposes of the Green TAC was to provide an additional "set of eyes" and expert peer review of the draft RMI report.

5. Seeking Public Input and Providing an Opportunity to Comment

BoS Ordinance 94-09 directed that "…the process of updating the Electricity Resource Plan should include public outreach to citizens, businesses, and all potentially interested groups including the Power Plant Task Force."

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[28] Recommendations 3.4.3 of the Peak Oil Task Force is itself a recommendation for San Francisco to "Produce an Updated Electricity Resource Plan."

[29] The Power Plant Task Force was created by BoS Resolution 119-04 to be the on-going successor to the Potrero Power Plant Citizens Advisory Task Force (Resolution 362-99). Originally charged with providing the Board with input regarding the potential sale of the Hunters Point Power Plant and Southern Company's (later renamed Mirant and most recently GenOn) purchase of the Potrero Power Plant, the current role of the Task Force is to advise the Board on issues related to the construction of new power generation facilities in the southeast portion of San Francisco, power demand management and energy policy for the City.

[30] Affiliations are provided for information and identification purposes only and do not represent endorsement by the listed entity for Green TAC recommendations.

In response to this guidance, the SFPUC has held numerous meetings in a variety of public forums to present the 2011 Updated ERP's findings and seek public input. In addition, the SFPUC has posted versions of its draft 2011 Updated ERP on SFPUC's website with opportunities for public input via email. A full listing of these efforts is contained in Appendix 4.

This 2011 Updated ERP synthesizes and combines all of this material into a single integrated report.

CHAPTER 3

BACKGROUND ON SAN FRANCISCO'S ELECTRIC USAGE

THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
A Department of the City and County of San Francisco, California

CHAPTER 3 - BACKGROUND ON SAN FRANCISCO'S ELECTRIC USAGE

Total electricity usage in San Francisco is currently approximately 6,000 gigawatt hours (GWh) per year, and is forecasted by RMI to grow at the rate of 1.3% per year to approximately 8,000 GWh per year by 2030.[31]

Three primary providers serve the electricity needs for the City. PG&E is the energy provider for retail customer loads serving about 75% (4,500 GWh) of the electric energy used in San Francisco. The SFPUC Power Enterprise serves all municipal facilities and selected other customers. The SFPUC provided about 17% (1,000 GWh) of San Francisco's energy usage.[32] The remaining 8% of energy is supplied by third party ESPs that serve direct access customers. Direct access customers are those customers who can choose to buy their energy from a third party via direct bilateral contracts.[33]

ENERGY VOCABULARY

A typical incandescent light bulb is rated at 100 watts. If left on for one hour, a typical light bulb will use 1/10th of a kWh of energy.

In San Francisco, an average home uses approximately 400 kWh/month or 4,800 kWh/year. This is equal to 4.8 MWh.

One megawatt is equal to 1,000 kilowatts. Average hourly electric consumption in San Francisco is about 700 MWh and peak demand (the highest hourly demand) is about 970 MW.

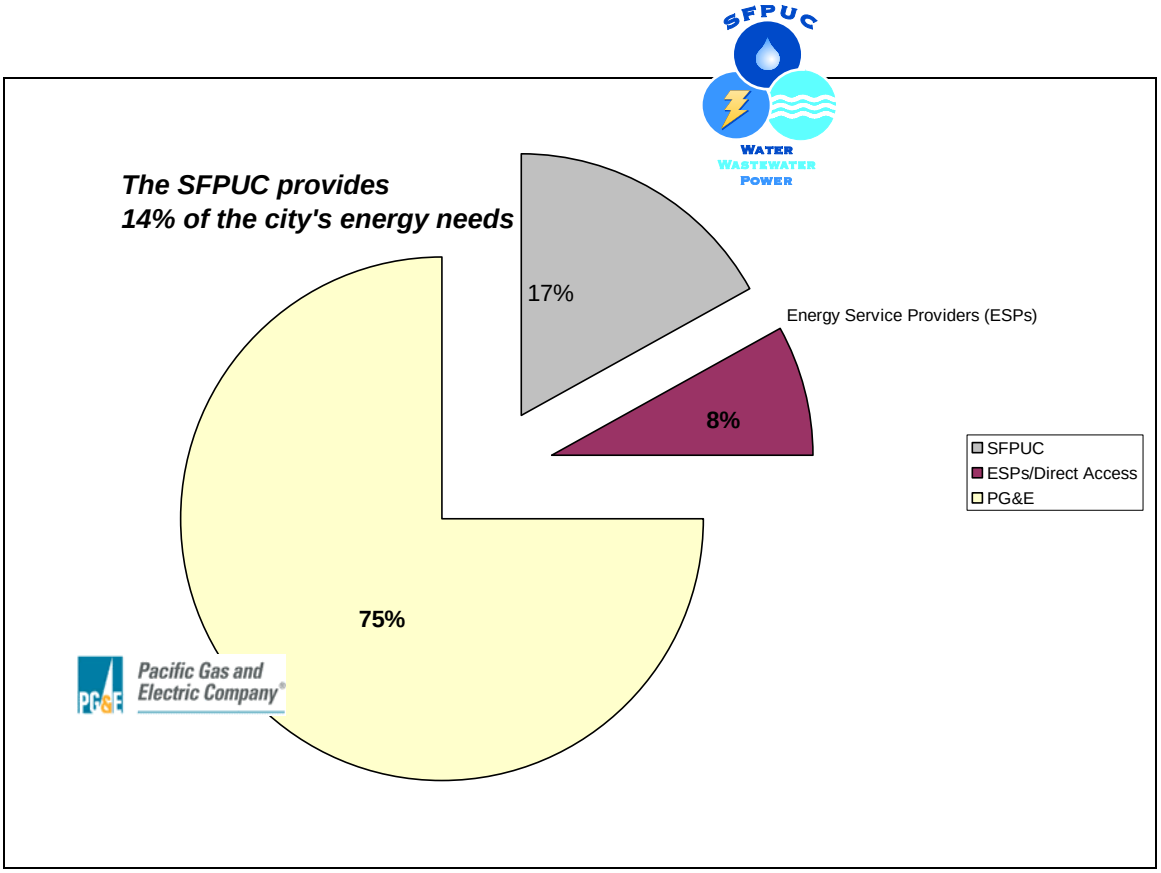
One gigawatt is equal to 1,000 MW or 1,000,000 kW.

[31] This is the baseline forecast that already includes the effects of on-going energy efficiency efforts to reduce demand. One of the goals of this 2011 Updated ERP, and a recommendation of both RMI and the Green TAC, is to maximize the use of cost-effective energy efficiency to reduce this growth rate further.

[32] For purposes of this 2011 Updated ERP the SFPUC's provision of electric service to San Francisco International Airport (SFO) is included in total energy usage for the City.

[33] Direct access, created as a result of California's restructuring of its electric industry in 1998 through AB1890, allowed individual customers to purchase their electric energy directly from generators or other suppliers (ESPs) while PG&E would continue to be responsible for the energy's transmission and distribution. Although the State Legislature suspended direct access during the energy crisis in 2001, existing direct access customers were grandfathered and allowed to remain in the program. In San Francisco, although fewer than 800 customers use direct access, given their large size they constitute about 8% of total energy usage in the city and include about 60% of San Francisco's largest customers (such as downtown office buildings, large department stores, and industrial customers). As a result of SB695, passed by the Legislature in 2010, large customers are again be able to choose direct access, subject to the total amount of direct access load being capped at a set percentage of the utility's total load. Residential and small commercial customers are not be eligible for direct access.

Figure 3
RESPONSIBILITY FOR PROCURING ELECTRIC ENERGY TO SAN FRANCISCO IS DIVIDED AMONGST THE SFPUC, PG&E AND ENERGY SERVICE PROVIDERS
(% OF SAN FRANCISCO ELECTRIC ENERGY USE SERVED BY PROVIDER)



Source: SFPUC 2005 CCA Implementation Study, SFPUC Business Plan, PG&E 2005 Martin Substation Load Data

Figure 4
ELECTRIC ENERGY USAGE IN SAN FRANCISCO BY VOLUME TOTAL USAGE: 6,000 GWH

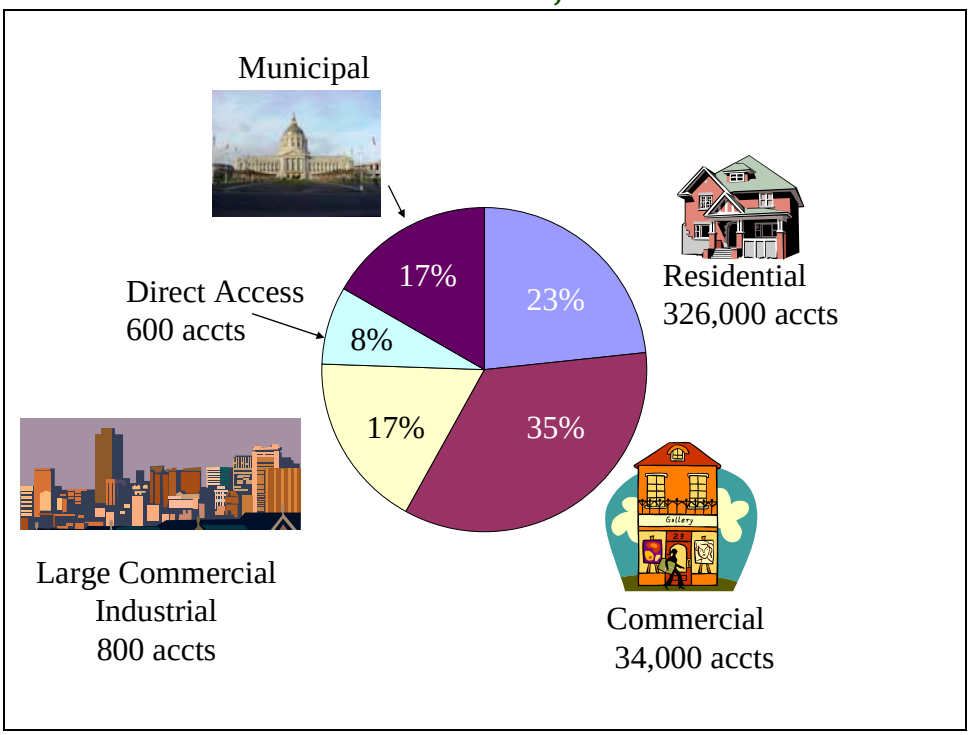


Table 2
ELECTRIC USE BY END-SECTOR

	2008	
	GWh	% of Consumption
Commercial Lighting	1,200	20%
Commercial Other	1,000	16%
Commercial HVAC	830	14%
Commercial Refrigeration	460	8%
Residential Lighting	570	10%
Residential Other	510	8%
Residential Refrigeration	230	4%
Residential Heating	100	2%
Residential AC	-	0%
Municipal	1,000	17%
Industrial	130	2%

SOURCES: RMI Draft Report, p. 11

GHG emissions from the electric sector represent about one quarter (24%) of San Francisco's total GHG emissions (1.7 million tons out of 7 million tons) with transportation responsible for about half (53%) of total emissions and natural gas and steam usage accounting for the remainder.[34]

RMI's calculations of GHG emissions for the electric sector are based on examining the underlying resource portfolio for each of the three main energy providers in San Francisco.

PG&E's resource mix (which is the same for its City customers as it is for the rest of its system) includes a significant amount of large hydroelectric power and nuclear generation (38%).[35] Another 14% of its generation mix consists of RPS-eligible renewable generation. Together, these GHG-free generation resources total over 50% of PG&E's portfolio. The remainder of PG&E's supply mix consists of fossil-fired power plants, mostly natural gas. PG&E is required to increase its renewable generation from RPS-eligible resources to 33% of electricity sales by 2020 to comply with CARB's RES and California's RPS.

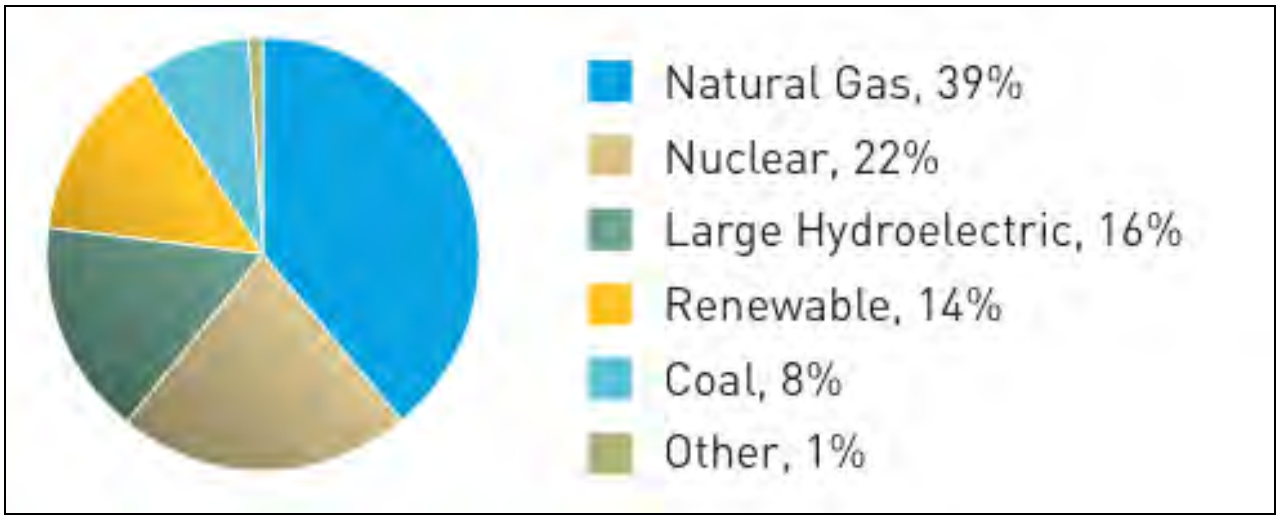
Energy supplies for the SFPUC come almost completely from the three hydroelectric power plants that the SFPUC owns and operates associated with San Francisco's Hetch Hetchy system. Under the City's "water first" policy, the primary purpose of the Hetch Hetchy system is to provide water to over 2.5 million customers, including all San Francisco residents. The availability of hydroelectric power in a given year varies depending upon the operation of the water system. During the spring run-off, the power generation facilities of the Hetch Hetchy system have a maximum capacity of approximately 400 MW. However, the average annual output is closer to 200 MW for a total yearly generation of 1.7 million MWh of electricity.[36]

[34] San Francisco Climate Action Plan

[35] As noted in the Terminology section of this report, RMI's definition of zero-GHG energy resource includes nuclear and hydroelectric generation and is similar to the definition recently adopted by the CARB. For purposes of this study, it is assumed that the use of power from large hydroelectric and nuclear is limited to generation from existing sources.

[36] Average generating capacity based on a seven-year historical average (1997–2003) is 201 MW.

Figure 5
PG&E's 2008 ELECTRIC POWER MIX
DELIVERED TO RETAIL CUSTOMERS[37]



Source: April 2009 Power Content Label, consistent with PG&E's submittal to the CEC on March 2, 2009.

While this quantity of power exceeds San Francisco's average municipal maximum demand of 140 MW and total annual consumption of approximately 900,000 MWh, the City needs to supplement its power sources to meet municipal demand and its contractual obligations during the summer and fall months when hydroelectric generation is reduced so that water can be stored. Depending upon hydrological conditions, Hetch Hetchy generation typically meets 90% to 100% of the SFPUC's energy needs. Any shortfall is typically purchased from the marketplace.

For purposes of its draft report, RMI assumes that all of the SFPUC's power will come first from its GHG-free Hetch Hetchy power with any remaining energy needs coming from RPS-eligible resources.[38]

ESPs provide power to selected customers under the CPUC's direct access rules and are also subject to the state's RPS requirements and will need to procure 33% of their energy from renewable sources by 2020.

[37] PG&E's 2008 "Corporate Responsibility Report", page 57 notes: "The continued drought conditions in California have reduced hydroelectric generation. As a result, PG&E purchased more electricity than usual from the wholesale market in 2008. California regulators require PG&E to assume that a certain portion of these market purchases comes from coal-fired generation and renewable resources. As a result, the chart shows an increase in coal-fired generation, although PG&E's direct purchases of coal, which PG&E is required to buy from small power producers, remain minimal at 1.7%. Additionally, 12% of PG&E's delivered energy came from RPS-eligible resources; the chart shows 14%, reflecting an additional 2% from open-market purchases that do not count toward the state's RPS target."

[38] The RMI report "assume[s] in this report that in the 2010–2030 timeframe, emissions from serving SFPUC load are assumed to be zero as a result of the City procuring only renewable energy to serve load not met with Hetch Hetchy generation."

CHAPTER 4

RECOMMENDATIONS THAT EMPOWER CUSTOMERS AND LEVERAGE SAN FRANCISCO'S EXISTING CAPABILITIES TO PROMOTE ZERO GHG ENERGY

THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
A Department of the City and County of San Francisco, California

CHAPTER 4 - RECOMMENDATIONS THAT EMPOWER CUSTOMERS AND LEVERAGE SAN FRANCISCO'S EXISTING CAPABILITIES TO PROMOTE ZERO GHG ENERGY

The 2002 ERP realized that:

> Implementation of the Plan will require the cooperation of many organizations, including but not limited to the California Public Utilities Commission (CPUC), the California Independent System Operator (CAISO), the California Energy Commission (CEC), the California Power Authority,[39] Pacific Gas and Electric Company, independent power developers, energy service companies and other departments and agencies of the City and County of San Francisco. (Preface, p. iii)

The major challenge in developing a city-wide electricity resource plan is the fragmented nature of energy procurement decisions for San Francisco. As noted in Chapter 3, responsibility for procuring electric energy within San Francisco is divided between PG&E, direct access providers, and the SFPUC.

PG&E, TransBay Cable and the direct access providers are subject to extensive regulation by the CPUC with respect to retail transactions and electricity distribution, and the FERC with respect to applicable wholesale transactions and electricity transmission. State and federal regulation largely pre-empt San Francisco from regulating terms and conditions for electric service by PG&E, TransBay Cable and direct access providers as well as determining the rules under which San Francisco can use PG&E's distribution system and the transmission system serving San Francisco.

In order to serve its municipal load, San Francisco entered into an Interconnection Agreement (IA) with PG&E where PG&E transmits Hetch Hetchy electric generation from Newark to municipal loads using PG&E's transmission and distribution system. Under the IA, the SFPUC is limited to providing Hetch Hetchy power almost exclusively to municipal load customers and PG&E has opposed efforts by SFPUC to extend this service to other customers (see Recommendation # 13).

The recommendations listed in this chapter apply to all of San Francisco's residents, businesses and municipal buildings.

When San Francisco chose to provide electric service to Hunters Point, it needed to take service under a FERC-approved Wholesale Distribution Tariff (WDT) with PG&E defining how San Francisco's distribution system would access to and interconnect with PG&E's system.

Given these limitations, the consensus of the Green TAC was that San Francisco should focus its efforts on those activities where San Francisco not only has a strong ability to implement programs but also has the legal ability (through incentives, ordinances, and tax policies) to do so. Most of these activities fall into what are often called "behind-the-meter" programs - activities and measures that a customer (or group of customers) can do without needing approval from state or federal regulatory authorities.

Under the regulatory structure established by the CPUC that governs investor-owned utilities such as PG&E, there is a significant difference between activities that occur on the customer-side of the meter and those that occur on the utility-side of the meter. The net effect of all of these activities is to reduce the amount of energy the customer needs to procure from PG&E and other ESPs. While San Francisco cannot directly control the content of PG&E's and

[39] Although legally this agency still exists, the Governor's Office has neither chosen to fund nor appoint board members to this agency, making it essentially inactive.

ESPs' supplies, it should encourage cost-effective GHG-reducing behind-the-meter activities to reduce the amount of energy needed to be procured by PG&E and ESPs.

Behind-the-meter programs include such activities as:

- Reducing a customer's energy demand through energy efficiency programs;
- Reducing peak energy usage through demand response and on-site storage;
- Allowing customers to generate their own power on-site (for example through rooftop solar or on-site cogeneration), provided that they meet applicable safety standards in connecting to the utility system; and
- Community-scale measures that implement behind-the-meter activities.

There are also some areas of the City, such as at Treasure Island, Hunters Point and HopeSF projects for example, where the City can take a more active role for the customers it serves. While public power is not technically a behind-the-meter program, it does offer an opportunity for the City to more directly influence and promote customer-side measures for the customers it serves directly.

In most cases these activities can be carried out more quickly than other supply-oriented activities. Thus they correspond to the Board's direction that the SFPUC develop short term goals that can be implemented quickly.

Two additional advantages of these local behind-the-meter activities are that they promote local economic development and improve the reliability of the local electric system. San Francisco's successful GoSolarSF program is one such behind-the-meter program because it promotes customer-side on-site generation. Both GoSolarSF and the City's ongoing municipal solar installation program have increased the renewable energy available to the electric grid within San Francisco while also fueling the City's local solar industry and creating jobs. In addition to solar, many of the technologies that would be used to improve the reliability of the local electric system, such as energy efficiency and CHP, also promote economic development by reducing customers' overall energy costs over the life of the project. A potential down-side, as noted in the RMI report, is that some of these local technologies, particularly roof-top solar and small-scale wind, currently have significant up-front costs and some are significantly more expensive than conventional electric service on a life-cycle basis.

Most behind-the-meter activities also reduce the departing load charges or exit fees imposed by PG&E. Under rules developed by the CPUC, for example, a customer who chooses to take electric service from San Francisco's CleanPowerSF will pay departing load charges to PG&E.[40] The purpose of some of these departing load charges, as defined in state regulation, is to compensate PG&E for prior investments and contract commitments for electric generation made on behalf of the departing customer. The Green TAC estimated that one of these charges, the PCIA, is about 18% of PG&E's generation costs. Thus a customer who chooses to increase the renewable content of its electricity supply by purchasing from CleanPowerSF will have to pay PG&E a departing load charge, while the same customer would reduce its departing load charge if they installed on-site solar PV system that provided the equivalent amount of renewable energy.

The RMI draft report also concluded that San Francisco's currently limited ability to control PG&E's electricity purchasing decisions warrants a strong focus on these behind-the-meter initiatives:

> If the status quo level of [local] control remains in the near term, San Francisco focuses on CHP and "behind-the-meter" efficiency and renewables in city [to meet its GHG reduction goals].[41]

[40] PG&E's departing load charges include, for example, the Power Charge Indifference Adjustment (PCIA), the Competition Transition Charge (CTC), the DWR Bond Charge, and the Energy Cost Recovery Amount (ECRA).
[41] RMI Draft Report, p. 64.

Given this limited ability, the RMI draft report proposed a series of "no regrets" recommendations that San Francisco should pursue regardless of whatever policy direction San Francisco chooses to ultimately adopt for its energy industry.

No Regrets Resource Options

Given the similarities in the long-term resource portfolios developed by RMI as part of their analysis and slight differences in the cost and availability of resources in the short term, San Francisco has a number of "no regrets" resource options that it should pursue. These include:

- Aggressively pursuing demand-side efficiency for reducing GHG emissions and load management to enable increased solar and wind adoption;
- Promote distributed and building-scale supply-side renewable resources "behind-the-meter" - the byproduct of which is local job creation;
- Continuing to operate Hetch Hetchy, including ongoing maintenance and refurbishment to maintain reliability, performance, and power output; and
- Actively develop sources of indirect CO_2 reductions such as electrified vehicles and CHP that San Francisco can generate internally to offset limited fossil imports.

SOURCE: RMI Draft Report, p. ES-11

The Green TAC focus on behind-the-meter programs is similar to the two "local control" scenarios of future trends that were modeled by RMI in their draft report.[42] These two scenarios also assume that San Francisco is limited in its ability to directly influence the electricity purchasing and investment decisions of PG&E and other direct access providers.[43]

Another concept advocated by the Green TAC was to be "technology neutral." As the RMI draft report stated:

> [A] number of potential zero-GHG technologies could meet San Francisco's energy needs, and predicting their future price and relative availability is difficult.
>
> Especially in the medium (2015–2020) and long term (2020–2030), the actual composition of San Francisco's resource portfolios will deviate from those we have created [in their scenarios] based on a number of factors, including future technology costs; financing costs and ability of energy providers to secure favorable contracts; and additional purchases of capacity and energy. These factors…imply that San Francisco is not rigidly bound to the resource selections identified in this analysis.[44]

Accordingly, San Francisco's policies should focus on setting specific goals and developing a comprehensive program, and then allowing end-use customers to identify the optimal mix of technologies to meet this goal. This is similar to the approach currently used by the state for building energy efficiency standards, setting an overall goal and letting the builders trade-off the various technologies (e.g. more insulation vs. a more efficient furnace vs. triple-paned windows) to meet the goal.

Based on the input received from the Green TAC and RMI the following goals are proposed to empower San Francisco's residents and businesses.

[42] These two scenarios are the Status Quo Declining (Technology) Cost and the Status Quo Constant (Technology) Cost.
[43] The RMI draft report believes, perhaps incorrectly, that this will be particularly true between now and 2020 as PG&E focuses on meeting its own renewable portfolio standards established by state law.
[44] RMI Draft Report, p. 86.

RECOMMENDATION 1 - INCREASE ENERGY EFFICIENCY PROGRAMS

Improve and expand energy efficiency programs in San Francisco.

Background

Although energy efficiency is itself just one of the behind-the meter measures that San Francisco should promote, it is listed separately here given its importance as one of the easiest and most cost-effective GHG-reduction strategy that San Francisco can pursue.

As RMI noted:

> It cannot be emphasized too strongly that continued and increased emphasis on energy efficiency is the least expensive lever to reduce San Francisco's GHG footprint. While accessing that opportunity is more complex than building or acquiring generation, it is well worth the effort and can dramatically help reduce system costs.[45]

Successful implementation of energy efficiency programs require a combination of funding and incentives, long-term financing, and educational/outreach programs. These programs can be combined with changes to San Francisco's building codes to create a synergistic effect. CleanPowerSF, once implemented could provide an additional source of education/outreach and funding to further encourage energy efficiency.

Current Funding Levels

As noted earlier, the CPUC's adopted Energy Action Plan in 2003 establishes state policy that future energy needs should be met first with energy efficiency before acquiring additional resources. As a result statewide funding of energy efficiency has significantly increased.[46] With regards to funding, PG&E is responsible for providing energy efficiency services for all of the City's private businesses and residences, subject to the oversight of the CPUC. The SFPUC is responsible for energy efficiency services for municipal buildings.

For 2011, PG&E is projecting to spend close to $450 million in energy efficiency measures in its service territory.[47] PG&E estimates it now spends about $25 million per year in San Francisco on energy efficiency related activities. This is consistent with San Francisco representing about 5% of PG&E's electric load. Some of this money is spent in partnership with the SFE. The SFPUC's 10-year CIP is budgeted to spend $15 million on energy efficiency programs for municipal facilities. As discussed further below, PG&E collects all of its funding from its customers through either the state-mandated public goods charge (PGC) or through the 'energy efficiency' procurement amount included in distribution rates.

New Sources of Funding

TransBay Cable Funds. A new funding option available for San Francisco will be the use of funds received from TransBay Cable as part of its licensing agreement with the City to lease Port property and right-of-ways needed for the project. Under this agreement, the City will receive a "SF Electric Reliability Payment" of $2 million per year for

[45] RMI Draft Report, p. ES-14.
[46] The CPUC recently issued a Long-Term Energy Efficiency Strategic Plan to guide the design of energy efficiency programs by California's Investor Owned Utilities.
[47] See PG&E's Advice Letter 3727-E (September 1, 2010), Annual Electric True-Up, page 11, Projected 2011 Revenue Requirement.

10 years, beginning in 2011 and adjusted yearly for inflation. BoS Resolution 414-07 directs that this money should be used "specifically [for] renewable energy, conservation, and environmental health programs which benefit low income, at-risk, and environmentally disadvantaged communities." $2 million of these funds will also be set-aside for use by the Mayor's Office of Economic and Workforce Development (OEWD) on "green jobs training and placement programs which benefit low -income, at-risk, and environmentally disadvantaged communities." Prior to allocating these funds, BoS Resolution 414-07 directs OEWD to consult with appropriate City Departments, and community members, including the Power Plant Task Force, in determining how to allocate the funds.

GreenFinanceSF. One of the problems with energy efficiency (as with many other behind-the-meter technologies) is that while in the long-term they save money, consumers must bear the up-front costs of installing the appropriate technology. One way to resolve this problem is to provide long-term funding for these projects.

To address this problem, San Francisco created a Property Assessment Clean Energy (PACE) bond financing program, GreenFinanceSF, that would have provided $150 million in long-term loans to cover the cost of installing energy efficiency and renewable energy technologies. Under the GreenFinanceSF program, property owners are loaned the necessary money to finance the cost of efficiency and renewable generation improvements, and then these funds are repaid through annual or semi-annual payments collected as part of the property owner's property tax bill, also known as tax-lien financing. Since the loan is tied to the property, if the owner sells the property, the new owner assumes responsibility for repayment of the loan. This provides an incentive for a property owner to make long-term investments in energy efficiency, knowing that the cost of these activities will be assigned to the next owner of the building if the original owner decides to sell his/her property.

Unfortunately, implementation of this program is currently hindered, and has been temporarily suspended, due to uncertainty over the effect of this tax assessment on the ability of the homeowner to repay any secured mortgages associated with the property (as those mortgages are second in priority to the property tax bill). As a result, the two government sponsored-entities that guarantee more than half of the residential mortgages in the United States (Fannie Mae and Freddie Mac) have refused to guarantee mortgages on homes that utilize GreenFinanceSF financing.[48]

Prompt resolution of this concern should allow this program to commence operation, significantly increasing funding sources for energy efficiency investments.

Resolution of "Split Incentives" for Owners and Tenants

An additional problem in securing funding for energy efficiency upgrades is the "split incentive" problem in that the entities that often pay the electric bill (such as tenants) are not the same entities that control the ability to install the efficiency upgrades (e.g. landlords).

This split incentive problem is particularly acute in San Francisco, where buildings with two or more units comprise more than 60% of all residential buildings, compared to 25% state-wide. Additionally, a substantial portion of commercial space is tenant-occupied.

The split-incentive problem highlights that how energy efficiency funds are spent is as important as the level of funding and the target customers.

Programs that work on a state-wide basis may not work as well in San Francisco given the high proportion of tenants. Programs, such as SFE's Energy Watch and Peak Reduction programs that are administered by SFE but funded by PG&E, are examples of programs that seek to address San Francisco's unique concerns. As discussed below, developing energy efficiency programs and incentives that better target San Francisco should continue to be a priority.

[48] New York Times, June 30, 2010.

Administration and Collection of Public Goods Charge

PG&E's funding for its energy efficiency programs is split almost 50/50 between PPGC and "procurement energy efficiency." PGC is a state-mandated component of rates that is used to fund public purpose programs such as energy efficiency, RD&D, renewables, low income energy efficiency and low income assistance.

After adoption of the Energy Action Plan in 2003, the CPUC significantly increased the funding levels for energy efficiency measures beyond the amounts legislatively mandated for the PGC, as well as allowing utilities to spend funds on energy efficiency as part of their procurement activities. The costs of these programs are collected through electric rates paid by all customers, regardless of who provides their electricity supplies.

Table 3
PG&E's ENERGY EFFICIENCY SPENDING PROJECTED FOR 2011

Public Goods Charge, EE-related	
Energy Efficiency	$120,701,518
Low Income Energy Efficiency	$93,478,228
Total Public Goods Charge EE	$214,179,746
Procurement Energy Efficiency	$233,408,114
Total Energy Efficiency	$447,587,860

The statute that directs the collection of the PGC expires on January 1, 2012. While it's unlikely that either the CPUC or the state legislature would eliminate funding and budgeting for energy efficiency programs, the need for the State Legislature to reauthorize collection of the Public Goods Charge (PGC) before January 1, 2012 provides an excellent opportunity for San Francisco to advocate not only for continuation of the program at existing or enhanced levels but also to advocate for more fundamental changes in how the program is administered.

Proposal

San Francisco could advocate that PGC energy-efficiency funds collected by PG&E from its customers within San Francisco be allocated, controlled and administered by San Francisco itself, or alternatively, by a third party administrator, rather than by PG&E. This would provide San Francisco with significantly more control over how those funds are deployed.

There are a number of concerns with utility management of the PGC energy efficiency programs. First, a significant portion of the funds go towards the administration of the programs. Compounding this problem, the CPUC has adopted a risk/reward incentive mechanism that rewards the utilities if they exceed specified targets, and those incentives are included in the cost of the programs. These factors make utility administration of energy efficiency programs costly. In addition, the shareholder incentives have generally biased utilities in favor of short term, easily obtained savings, rather than long term savings and comprehensive evaluation and prioritization of program alternatives. In addition, the development and implementation of appropriate Evaluation, Measurement and Verification (EM&V) programs, upon which the utilities' incentives are based, have become extremely contentious.

Other energy efficiency program models exist in the United States with alternative program administration and governance structures. Having a non-profit or other type of third party administrator can better align policy goals with the programs and would harness economies of scale if done at the state level. Another option could be for local

cities and counties to designate themselves as the administrators of PGC energy efficiency funding for their areas, thus providing increased local control of these activities and increasing the opportunity to link these programs with other City objectives such as job training, and other economic development programs.

CleanPowerSF offers an additional opportunity for increased control and discretion over PGC energy efficiency funds collected from San Francisco's electricity customers. State law provides that CCAs be allowed to apply to the CPUC to become the administrator of these funds for its customers.[49] The CPUC is currently developing the rules that would govern this process, although current proposals put forth by PG&E and other California utilities would result in no change to the existing structure.

Additionally, once CleanPowerSF begins operation, it will offer energy efficiency programs as part of its service offering to its customers, supporting the cost of these programs by including their costs in to the rates charged to customers. For CleanPowerSF, the City could seek its appropriate share of the non-bypassable charges (including PGC funds) paid by CCA customers for energy efficiency programs. This is an important element of CleanPowerSF program, both in terms of potential to reduce costs of electricity supplies over the long term, and to better focus, target and optimize energy efficiency initiatives within San Francisco to best meet the City's needs and objectives.

Potential Concerns

The creation of a local government or third party administration of PGC programs:

- Could potentially be disruptive to the operation of existing Energy efficiency programs if not transitioned properly;
- Could take time and political will and resources; and
- Will require measures to ensure transparency and accountability.

Need for Changes to Existing City Ordinances

- None Identified. Should local governments be designated as eligible PGC administrators in the future, San Francisco would need to create the appropriate organizational structure to administer the program.

Next Steps

1. Continue funding and deploying Energy Efficiency measures to Municipal facilities ($16 million for the next 10 years).
2. Work with other local governments and stakeholders to advocate not only for continuation of the PGC program at existing or enhanced levels but also to advocate for more fundamental changes in how energy efficiency programs are administered.
3. Work with other local governments and stakeholders to resolve the inability to offer GreenFinanceSF funding for long-term investments in energy efficiency and renewable energy.
4. Work with PG&E, CCA, and others to develop energy efficiency programs that address San Francisco's unique concerns.
5. Work with appropriate City Departments, community members, Power Plant Task Force, and OEWD to identify uses for the SF Electric Reliability Payment funds.

[49] Thus, the CCA would only receive the non-bypassable energy efficiency funds from CleanPowerSF customers, not the total amount of funds collected in San Francisco. Moreover, some upstream state programs would likely continue to be provided by the investor owned utilities.

6. Work with other City Departments to identify structural challenges and propose recommendations to address the split incentive issue.

ENERGY EFFICIENCY / PGC FUNDING
(Applicable RMI Recommendations)

EE – 3	BoS should consider mechanisms for raising additional funds for energy efficiency implementation beyond monies already collected through PG&E's Public Goods Charge and the SFPUC's Sustainable Energy Account (5% of revenues).

(Applicable Climate Action Plan Recommendations)

3.3.A	Increase Incentives, Direct Installation and Technical Assistance
3.3.B	Expand Education and Outreach.

(Applicable Peak Oil Task Force Recommendations)

3.4.7	Develop a better working relationship with PG&E to administer state (CPUC) energy efficiency funds in an effective way that is consistent with City goals.

RECOMMENDATION 2 - PROMOTE BEHIND-THE-METER ACTIVITIES

Improve and expand the development of distributed generation resources such as small-scale CHP and renewable energy.

Background

Behind-the-meter generation activities include on-site renewable energy such as roof-top solar and small-scale wind, on-site cogeneration (also known as combined heat and power or CHP), and potential emerging technologies such as fuel cells[50] and electric storage.[51]

As noted in the introduction to this chapter, the advantages of behind-the meter resources are that they can reduce the amount of energy the customer needs to procure from the incumbent utility such as PG&E, be carried out by the customer, improve local reliability, and provide local economic and job opportunities.

Many of the same issues applicable to promoting increased use of energy efficiency are equally applicable to promoting behind-the-meter generation. Similar to energy efficiency, although many of these technologies are cost-effective and save consumers money over the life of the project, high-up front costs limit their use. Increased educational and outreach efforts of the advantages of the technology are also needed, as well as potential changes to building/zoning codes and permitting requirements to increase their use. A major goal of San Francisco should be to maximize available funding and incentive programs for their use. The following activities identify options to increase the use of small scale CHP and renewable technology within San Francisco.

Proposal

Although many types of behind-the-meter activities actually save consumers money over the product's life-cycle, many of them have high up-front costs that act as a deterrent to their use. Therefore, identifying funding mechanisms to cover these costs need to be identified. San Francisco should seek to develop and access all available funding to promote behind-the-meter activities.

As noted in Recommendation #1, San Francisco's GreenFinanceSF program would have allowed the use of bonds to allow home-owners to finance energy efficiency and renewable energy improvements over the long-term through an additional assessment on their property tax bill. This program is currently on hold, pending resolution of credit issues raised by Fannie Mae and Freddie Mac.

Under various mandates and programs established by the CPUC, for example, there are a number of programs available that offer opportunities for small-scale distributed generation to either receive long-term contracts to sell their power or to sell as-available power to PG&E. Under most of these programs, PG&E is required to purchase the output from these distributed generation facilities at set prices. Available programs exist for small-scale renewable energy (under 20 MW), combined heat and power facilities (under 20 MW), and a rebate program to encourage the use and development of fuel cells.

Several of these programs offer feed-in-tariffs (FIT) that pay the distributed generation resource the same price that it would otherwise have cost PG&E to acquire energy from a large-scale fossil-fueled power plant, currently in the range

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[50] San Francisco currently has one fuel cell in operation at the U.S. Postal Service Bayview facility. Although the technology is proven, the cost of fuel cells limits their use. The 2002 ERP, for example, envisioned them as an emerging technology in the post-2012 time-frame.

[51] Electric storage through batteries is discussed in Recommendation #6.

of $85 to $95 per MWh.[52] This price should be sufficient to support the development of small-scale fossil-fueled CHP units within San Francisco but currently unlikely to be sufficient to fully support the cost of GHG-free technologies. PG&E is also conducting several Requests for Offers (RFOs) for small-scale renewable energy facilities (from 1 to 20 MW) that could provide payments up to $246/MWh.

CleanPowerSF, once operational, will also evaluate and develop similar programs, provided the CCA can support the cost of these programs through rates charged to its customers, while still offering competitively-priced electricity service that will attract wide participation by both residents and businesses. For example, the $246/MWh that PG&E can pay for renewable energy is over three times PG&E's avoided cost of providing electricity upon which CCA rates are based.

San Francisco can also provide additional assistance to its residents and businesses to maximize participation in these programs (whether these programs are offered by PG&E, San Francisco's CCA, or both). This can be done through outreach programs, requiring new construction above a certain size to consider use of CHP and renewable technologies, and examining and adopting appropriate changes to building and zoning codes to encourage distributed generation development.

RMI also recommended that San Francisco provide residents with better information about the desirability of installing solar and wind facilities on their residences and providing information on interconnection requirements of small-scale generation to the PG&E grid. Consistent with this recommendation, the SFPUC has already developed a solar map, showing solar potential throughout the City, and has posted extensive data on wind patterns throughout the City. Further, as a result of a recent CPUC decision, PG&E is now required to, and has posted to its web-site, data on the potential amount of distributed generation that can be added at each of its substation sites.[53]

Finally, use of these programs by San Francisco residents and businesses would provide local economic and job opportunities associated with the construction and operation of these facilities. They would also improve local reliability by increasing the amount of in-city generation.

The effect of these programs on increasing local control of the City's electricity supplies and their make-up is mixed. Under PG&E's programs, as currently structured, the output of the distributed generation facilities would become part of PG&E's supply portfolio for its entire service territory. Further, local generation participating in PG&E's programs would not be available for participation in San Francisco's CCA program.

CleanPowerSF will likely be in direct competition with PG&E for access to these resources (both local resources and those located outside of San Francisco) for its own electricity supply portfolio. Additionally, PG&E's various programs set a floor price that San Francisco's CCA will likely have to pay to acquire these resources. A small-scale distributed generator in San Francisco, for example, would be unlikely to sell its power to a CCA for less than the $85 to $95/MWh price it could receive from PG&E. This may affect the economics and competitive position of CleanPowerSF.

To the extent funding sources are available, San Francisco could choose to supplement the various incentives offered by the state to further encourage development or renewable resources. This would be similar to San Francisco's GoSolarSF program, which supplements other state and federal rebates and incentives to install solar facilities using San Francisco dollars to leverage and maximize available funding.

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[52] As these tariffs are based on the utility's avoided costs, they are generally less generous than comparable feed-in-tariffs offered in countries such as Spain and Germany. Although feed-in tariffs in these countries have been extremely successful in spurring deployment of renewable technologies, they have typically provided large subsidies for the renewable technology, the cost of which is made up for by increased rates paid for by all of the purchasing utility's customers.

[53] CPUC Decision (D.)10-04-042.

The additional incentives available through the GoSolarSF program, for example, resulted in solar installations in San Francisco increasing 450% in its first year of operation. $6.3 million was requested and a total of 3 MW of solar power was either installed or committed.

As noted in Recommendation #1, the funds that the City will receive from the TransBay Cable as part of the "SF Electric Reliability Payment" of $2 million per year over the next ten years can also be used for renewable energy development as well as for energy efficiency and environmental health programs.

To maximize local control and ensure that local programs have maximum impact on the make-up of San Francisco's electricity supplies, once CleanPowerSF is operational, city-funded programs, such as GoSolarSF and funding from the SF Electric Reliability Payment not otherwise used for municipal projects, should be limited only to CCA customers.

Overall, programs such as the above will be essential to help develop smaller-scale on-site renewable energy technology that currently is not cost-effective. As the RMI draft report noted:

> In-city renewable resources - such as rooftop solar PV and wind - are among the most expensive, along with today's emerging efficiency and supply-side technologies, such as tidal and wave. These technologies exceed $300/MWh in cost.[54]

Table 4
COST OF SMALL SCALE (NON-UTILITY SIZED)
ON-SITE GENERATING OPTIONS

Technology	Capital Cost ($/kW)	Fixed O&M ($/kW-yr)	LCOE ($/MWh)
Solar PV (Residential)	10,500	75	300-330
Solar PV (Commercial)	8,715	45	230-250
Large Scale Solar	6,000	30	150-170
Wind (Building Integrated – Residential)	6,400	50	350
Wind (Building Integrated – Commercial)	6,400	50	360
Wind (Small Scale)	5,000	50	170
Offshore Wind	3,980	27	180-380
Wave[55]	3,100	124	90
Tidal	10,592	416	950

SOURCE: Excerpted from RMI Draft Report Table 12, page 40

As the above table shows, these technologies also have much higher up-front capital costs than existing technologies.

Another alternative to relying on either PG&E or CleanPowerSF to develop small-scale CHP projects could be to partner with NRG, the provider of steam services to the downtown San Francisco area. San Francisco is one of the few cities in California with a utility that provides thermal energy. NRG operates a network of steam pipes running through the downtown and civic center areas providing steam heat and hot water service to about 160 customers including office buildings, apartments, hotels, as well as City Hall and several other Civic Center municipal buildings.

[54] RMI draft report p. 36.
[55] SFPUC staff believes that the Capital Cost, Fixed O&M Cost and Levelized Cost of Energy (LCOE) for wave are unrealistically low. However, these are numbers that RMI relied upon in their analysis. Most of these cost estimates can vary widely based on site-specific conditions.

NRG currently generates most of its steam from its boilers located near Union Square. While NRG has pursued converting its boilers to cogeneration, to date it has not been able to receive a contract from PG&E to purchase the electric output from a new cogeneration facility that is necessary for the project to be economically viable. An alternative solution that would promote cogeneration within the City would be for NRG to develop a number of smaller cogeneration sites at its customer locations. While most cogeneration systems are sized to meet a location's thermal needs, with surplus electricity being sold to the grid, the presence of NRG's thermal steam system in San Francisco makes it possible for the opposite to occur, with cogeneration meeting only on-site electricity needs while providing surplus steam heat to NRG's system. An advantage of this approach is that many of the more desirable cogeneration sites within San Francisco are connected to PG&E's networked downtown grid which prevents them from exporting surplus power to the grid.

Job Creation

As noted, the byproduct of the development of small-scale, on-site renewable energy technology, whether through incentive programs like GoSolarSF or through an operational CCA program, is job creation. Creating green jobs while implementing programs that satisfy San Francisco's growing need for renewable energy and that displace traditional fossil fuel sources of energy is an ideal behind-the-meter activity that San Francisco can sponsor.

Potential Concerns

- Small-scale in-city renewable energy technologies such as roof-top solar and small-scale wind continue to be significantly more expensive than conventional resources, making their continued deployment (at least until their costs decline) contingent upon maintaining applicable state, federal, and local incentives and subsidies.
- Utilizing feed-in-tariffs and other programs offered by PG&E to promote distributed generation sets a floor price for these resources that a CCA provider would have to meet as well as making these resources unavailable for a CCA resource portfolio.

Need for Changes to Existing City Ordinances

- None identified at this time.

Next Steps

1. Continue funding of San Francisco's GoSolarSF program and on-going energy efficiency programs operated by SFE and SFPUC.
2. Identify available funding opportunities for local behind-the-meter technologies.
3. As part of San Francisco's CleanPowerSF CCA program, develop and include programs that facilitate and encourage cost-effective behind-the-meter technologies for integration into CleanPowerSF's electricity supply portfolio
4. SFPUC and City's energy service providers should evaluate the feasibility of non-traditional ownership models for CHP such as potential partnerships with NRG.
5. Work with PG&E to ensure that behind-the-meter resources are interconnected into the distribution system.

Table 5
DISTRIBUTED GENERATION INCENTIVES AVAILABLE TO FACILITIES AND PROJECTS IN SAN FRANCISCO

PROGRAM	TECHNOLOGY	SIZE LIMITS	PRICING	PROGRAM LIMITS PG&E SERVICE AREA
Net Metering	Wind/Solar Eligible Biogas Eligible Fuel Cells	Under 1 MW	Avoided Energy Cost	None
Feed-in-Tariffs	RPS Renewable Resources (wind, solar, geothermal, biomass, small hydroelectric)	Under 1.5 MW To be increased to 3 MW*	Use Market Price Referent (MPR)** $84/MWh for 10 year contract $97/MWH for 20 year contract	104 MW from water/wastewater Facilities PLUS 104 MW from all other sources
Renewable Auction Mechanism	RPS Eligible Renewables	Under 20 MW	Chosen by auction with least-cost projects chosen first. PG&E will conduct two auctions a year	105.2 MW will be available for each auction; Unsubscribed capacity carried over to next auction, until; Goal of 421 MW is reached.
AB1613 Feed-in-Tariffs	CHP	Under 20 MW	Use 10-year MPR less GHG compliance costs (<$84/MWh) plus 10% adder for meeting Resource Adequacy	None at this time
Small Generator Incentive Program (SGIP)	LEVEL 2 RENEWABLE WIND	30kW (0.03 MW) to 5 MW, only 1st MW qualify for incentive	$1,500/kW	Funded at $16 million/year Waiting list for available funding
	LEVEL 2 FUEL CELLS USING RENEWABLE FUEL	0 kW to 5 MW only 1st MW qualify for incentive	$4,500/kW Not eligible for both SGIP and Emerging Renewable Funding	
	LEVEL 3 FUEL CELLS (ANY FUEL SOURCE INCLUDING FOSSIL)	0 kW to 5 MW only 1st MW qualify for incentive	$2,500/kW	Funded at $16 million/year plus $28 million in unspent funding carried over from previous years (equal to about 18 MW of new projects)

* SB32 (Negrete, McLeod) will increase the size limit to 3 MW (Statutes 2009, Ch. 328) after the CPUC completes its proceedings to implement this requirement.

** The Market Price Referent (MPR) is based on the forecasted cost a utility would incur to build and operate a new gas-fired power plant. It is updated by the CPUC each year.

Table 5 - continued
DISTRIBUTED GENERATION INCENTIVES AVAILABLE TO SAN FRANCISCO

PROGRAM	TECHNOLOGY	SIZE LIMITS	PRICING	PROGRAM LIMITS PG&E SERVICE AREA
PG&E Solar Photovoltaic Program (CPUC D.10-04-052)	Utility-owned Solar PV, primarily ground-mounted on land already owned by PG&E including land near substations	1 to 20 MW	Rate-based Cost must be under $4,312/KW (DC)	250 MW Total (50 MW/year for 5 years)
	Solar PV owned by third-parties (Purchase Power Agreement)	1 to 20 MW Units under 1 MW may qualify for up to 5% of program size	Based on competitive solicitations with the successful bidders entering into a 20-year PPA with PG&E. Levelized Cost of Energy may not exceed $246/MWh.	250 MW Total (50 MW/year for 5 years)
CA Energy Commission Emerging Renewables Program	On-site Small-scale wind sized only to meet all or part of on-site demand	Under 50 kW (0.05 MW)	$2.50/kW for first 10 kW*; $1.50 for each additional kW up to 30 kW total	
	Fuel cells using renewable fuel source (e.g. biomass)	Under 30 kW (0.03 MW)	$3.00 per kW May not receive any credit under PG&E's SGIP program	

* As of April 7, 2011. Prior to then, the incentive is $3.00 per kW.

BEHIND-THE-METER ACTIVITIES
(Applicable RMI Recommendations)

CHP-2	SFPUC and City's energy service providers should evaluate the feasibility of non-traditional ownership models for CHP.
RE-4	PG&E should continue to find creative methods for providing critical funding for distributed renewable energy projects that would otherwise have trouble accessing capital markets.
RE-11	In collaboration with SFPUC, PG&E should evaluate geographically specific load-growth forecasts within San Francisco to anticipate and evaluate the impact of distributed generation on feeder lines, substations and transformers.

(Applicable Climate Action Plan Recommendations)

3.4 A	Develop Renewable Energy Projects

(Applicable Peak Oil Task Force Recommendations)

11.4.6	Supports the creation of a solar assessment district to enable City residents to use long-term low interest financing to fund the cost of installing solar panels.

RECOMMENDATION 3 - SAN FRANCISCO TEST BED

Develop San Francisco as a 'Green Test Bed' to promote and encourage the deployment of new energy technologies within the City as well as attracting green energy firms to locate within the City.

Background

Achievement of San Francisco's long-term goal of a zero-GHG electric system by 2030 will require not only significant improvements in the cost, feasibility, and ease of use of existing technologies but also the potential development of new technologies not yet envisioned. San Francisco has already committed itself to actively participating in the development of new clean technology industries in San Francisco and leveraging the significant technical and venture capital expertise within the Bay Area, including Silicon Valley, major research universities, and national research laboratories. San Francisco has already created a reputation as a City open to new environmental technologies and has actively recruited and fostered clean technology firms to choose San Francisco as a headquarters location. San Francisco is home to over 250 clean technology companies,[56] with a strong emphasis on solar companies.

In 2008 San Francisco instituted a Clean Technology Payroll Tax Exclusion, which excludes clean technology companies of less than 100 employees from local business taxes for 10 years, accommodating this industry's longer research and development cycle and resulting longer path to revenue and profitability.

Proposal

San Francisco should take all necessary steps to establish San Francisco as an innovative "Green Test Bed City," working with the California Energy Commission, U.S. Department of Energy, and others, to establish funding relationships to demonstrate emerging technologies at San Francisco residents and businesses. By declaring San Francisco a city open to the demonstration and deployment of new clean technologies, the City could benefit from increased investments in research and development, an increase in clean technology companies choosing to locate in San Francisco (thereby generating jobs and increased tax revenue) and further reinforcing San Francisco's reputation as a cutting edge municipality for environmental policy and early adoption of innovative technologies. While declaring itself a Green Test Bed alone will not bring new clean technology companies to San Francisco, it is a good first start and would establish a City policy to promote increased investment within San Francisco. However, the City will need to clearly develop a program with sound eligibility criteria to select viable demonstration projects.

There are several variants of this proposal that could be adopted. First, this proposal could be adopted on a city-wide basis, with San Francisco committing to work with research institutions, government agencies, and private businesses to encourage the development and deployment of new technologies anywhere in the City.

A second variant would establish clearly defined areas of the City as the "Green Test Bed." San Francisco could designate newly developing areas where the SFPUC is the provider of electric service, such as Treasure Island and Hunters Point, as test beds for the development of local on-site technologies. The need to install significant amounts of new electric infrastructure at these sites provides numerous opportunities to incorporate and test new technology. Using housing projects, such as those being developed by HopeSF, is another alternative. This approach could be structured to include the residents to participate in the testing process, not only using the technology but also being involved in its permitting, construction, and operation, thus learning marketable job skills in a growing industry. Both RMI, in its draft report, and the San Francisco Urban Wind Power Task Force also proposed "municipal demonstration sites" that would be well-suited for evaluating particular generating technologies, such as Twin Peaks,

[56] Mayor's Accountability Index, Dec. 2010.

Treasure Island or the San Francisco Zoo for wind, Ocean Beach for wave/tidal energy, or large warehouse districts for roof-top solar.

Potential Concerns

- Other factors might be more influential in drawing new clean technology firms to San Francisco, including access to tax incentives, access to real estate (including low rents) and access to a skilled workforce.
- If not evaluated and structured adequately, the City could spend money on ill-conceived projects.
- San Francisco will need to compete with other cities/states also seeking to promote development of GHG-reduction technologies.
- Other municipalities such as Sacramento and Los Angeles operate integrated electric utilities (owning generation, transmission, and distribution assets) that serve their entire city and may be better positioned for these activities.

Need for Changes to Existing City Ordinances

- Adopt City Ordinance identifying methods to streamline the process for clean energy vendors participating in demonstration projects.

Next Steps

1. Identify scope for a Green Test Bed and develop clear and detailed program criteria for demonstration projects to be included into the Green Test Bed framework.
2. Identify potential demonstration sites such as:
    - Redevelopment areas under City control such as Hunters Point and Treasure Island;
    - Civic Center (as part of the on-going Civic Center Sustainability Project);
    - Sites targeted to specific generation technologies (e.g. Twin Peaks, Treasure Island, or San Francisco Zoo for wind, Ocean Beach for wave/tidal, large warehouse districts for roof-top solar); and
    - HopeSF and other housing project development sites.
3. Identify and seek out research and funding opportunities for demonstration projects (on-going).
4. Leverage existing spending on GHG-reduction technologies to access funding for new demonstration/research/test projects.
5. Coordinate with existing incentives offered by the Office of Economic and Workforce Development for clean technology development such as the Clean Technology Payroll Tax Exclusion.
6. Work with PG&E to ensure that Green Test Bed demonstration projects are interconnected into the distribution system if necessary.

GREEN TEST-BED
(Applicable RMI Recommendations)

RE-6	The Office of Economic and Workforce Development, SFE, and SFPUC should collaborate to establish a formal pipeline that will streamline the process for clean energy vendors who would like to set up demonstration projects.
RE-7	SFE and SFPUC should proactively solicit opportunities to partner with private business, national research and development labs, and other institutions dedicated to the advancement of renewable technologies.
RE-8	SFPUC should construct a plan to establish municipal demonstration sites at locations around the City. Several locations have been identified, including Twin Peaks, Ocean Beach, and the San Francisco Zoo.
RE-10	The Mayor's Office should consider leading a stakeholder process to inform a master plan identifying San Francisco's most promising sites for large-scale renewable energy development.
ET-1	BoS and Mayor should consider providing incentives for companies engaged in battery and electric vehicle research that are located in San Francisco.

(Applicable Climate Action Plan Recommendation)

3.4 B	Conduct Pilot Projects for Emerging Technologies.

(Applicable Peak Oil Task Force Recommendation)

3.4.5	Advance a Green Jobs workforce development program.

RECOMMENDATION 4 - COMMUNITY SCALE ENERGY SYSTEMS

Advance and support Community Scale Energy Systems, both privately-owned as part of new development and through increased use of City-owned electric infrastructure where possible.

Background

"Community Scale Energy Systems" seek to extend the use of "behind-the-meter" activities (as identified in Recommendation #2) and apply them beyond a single building to a larger geographical area. This is accomplished by identifying large single parcels of property that are either currently not served by PG&E or are under control of a single entity. Examples of the first category include areas such as Hunters Point and Treasure Island, both of which the SFPUC is in the process of serving as well as future development projects in such areas such as Pier 70, Port of San Francisco property, and the TransBay Terminal and HopeSF.

Examples of large-scale private developments include such proposed projects as the California Pacific Medical Center or UCSF- Mission Bay facilities as well as renovations to large existing facilities such as Park Merced. It could also apply to large existing facilities such as college campuses or hospital complexes, community wide solar project (similar to SMUD's SolarShares), district heating and other distributed generation opportunities.

Proposal

This proposal would encourage new development to become increasingly energy self-sufficient, and perhaps ideally to be able to operate substantially "off-the-grid" by requiring all new developments of a certain size to determine if it is economically and environmentally beneficial to meet most or all of their electric energy needs on-site.

This would be achieved by an optimal combination of enhanced energy-efficiency, on-site renewable energy and/or cogeneration, and controlling demand response through smart grid and/or storage technologies. Ideally and in the longer term, many of these projects would become either "zero energy" sites able to operate independent of the electric grid or as net energy exporters to the grid, selling excess energy generated on site back to the utility.[57] The concept is based on each project being self-sufficient to the maximum extent possible while minimizing reliance on the existing electric grid.

Development of Community Scale Energy Systems would require a new City Ordinance that would set the overall goal (e.g. for overall energy usage or the amount of energy needed from the grid) and then allow developers the flexibility to optimize the mix of technology needed to achieve the goal.

A related feature of this proposal could require that the SFPUC (rather than PG&E) become the default provider of any remaining electric needs at these sites or facilities. Currently, the SFPUC is required to evaluate the feasibility of each new redevelopment project to determine if the SFPUC should offer service. Changing this proposal to make the SFPUC the default provider (unless the SFPUC determines it is not economical) and extending this requirement beyond just redevelopment projects to all developments above a certain size would assist the SFPUC in providing additional electric service within San Francisco and thus better positioned to facilitate development of Community Scale Energy Systems where appropriate.

[57] This could be done either by on-site generation or by the use of on-site storage that would store energy during times of low demand and export it back to the grid during times of peak demand.

Potential Concerns

- Ensure that any adopted requirements are cost-effective and do not discourage new projects within the City.
- Costs of developing the program for each area should be similar, or less than, the comparable life-cycle costs of taking service from the incumbent utility, although up-front costs may be higher.

Need for Changes to Existing City Ordinances

- Create City Ordinance defining the size threshold and appropriate energy usage targets for Community Scale Energy Systems.
- Amend Administrative Code, Chapter 99 (Public Power in new City Developments) to designate the SFPUC as the default provider of electric energy and distribution services to all identified Community Scale Energy Systems.

Next Steps

1. Explore feasibility of requirement and determine appropriate size threshold and appropriate energy usage targets for Community Scale Energy Systems.
2. Develop and modify City Ordinances as necessary, including clarifying entities responsible for performing the required analysis to achieve underlying goals.
3. Work with PG&E to ensure that Community Scale Energy Systems are interconnected into the distribution system.

COMMUNITY SCALRE ENERGY SYSTEMS
(Applicable RMI Recommendations)

EE – 10 (for larger projects)	SFE and SFPUC should work with the Mayor's Office of Housing (MOH) to develop and implement additional initiatives to further integrate efficiency into existing and new affordable housing.
RE-9 (for larger projects)	The Mayor's Office, SFE, and the San Francisco Planning Department should monitor the permitting process to ensure improved efficiency and consistently applied standards for renewable projects. *NOTE: Also addressed under Improved Building Standards.*
CHP-1	BoS should consider amending the City Green Building Ordinance to include a requirement that a CHP feasibility study be conducted for all new large development projects and major renovations.

RECOMMENDATION 5 - IMPROVE BUILDING STANDARDS

Improve Building Standards to encourage buildings to incorporate energy efficiency, on-site generation (e.g. on-site renewable energy as well as efficient, low-emitting cogeneration) and load-shifting and demand response capability through smart-grid technology and energy storage.

Background

One of the major ways to promote energy efficiency and promote behind-the-meter activities is through modifications to San Francisco's building standards. The City's Climate Action Plan found that energy use in buildings accounts for about 50% of San Francisco's GHG emissions, divided about equally between GHG emissions from electric generation and on-site usage of natural gas and steam for heating, water heaters, and cooking.

San Francisco has recently revised its building standards covering new construction and significant reconstruction of existing buildings.[58] Under these new standards, new buildings will generally have to meet energy efficiency standards that are 15% higher than the 2010 state standards recently set by the California Energy Commission through the California Green Buildings Code. The new standards also require larger new buildings to have 1% of their energy needs met by renewable energy. In approving these new standards, the Board of Supervisors found them to be cost-effective.

Based on recommendations from San Francisco's Existing Commercial Buildings Task Force, San Francisco has adopted an energy performance ordinance for existing non-residential buildings that would require building owners to conduct periodic energy audits and make the results available to building tenants, thus allowing them to better utilize existing financing and incentive programs to make cost-effective investments in energy efficiency.

Residential energy efficiency for existing buildings is currently covered by San Francisco's Residential Energy Conservation Ordinance (RECO). This Ordinance requires property owners to conduct an energy inspection and install certain energy and water conservation features before selling their home. To meet these requirements, property owners may spend up to 1 percent of the purchase price, or 1 percent of the assessed value, whichever is greater, capped at a maximum of $1,300 for one- and two-unit buildings. The list of conservation-related features includes such measures as ceiling insulation, weather stripping, water heater insulation, low flow devices, duct insulation, and for multi-unit buildings, boiler tuning.

Proposal

The State of California is required to update its building standards every three years, and local governments such as San Francisco are allowed to adopt more stringent standards if "reasonably necessary due to local conditions such as climate, geology, or topography."[59]

San Francisco should continue to parallel this effort, updating its own building codes to include additional cost-effective energy efficiency as well as tailoring energy efficiency measures to San Francisco's unique climate.

Since the total amount of new building in a year equals less than 1% of San Francisco's existing building stock, efforts should also focus on improving energy efficiency from the existing building stock. San Francisco's energy performance ordinance for existing commercial buildings is an example of such a program. Revising San Francisco's

[58] Ordinance 271-10, enacting a new Chapter 13C of the San Francisco Building Code.
[59] Ordinance 271-10, enacting a new Chapter 13C of the San Francisco Building Code.

Residential Energy Conservation Ordinance (RECO) is another option.[60] Both of these programs could be coordinated with the funding, incentive, and educational programs outlined in Recommendation #1.

RMI, in its report, also recommended that San Francisco ensure that building codes continue to evolve and be updated to accommodate emerging GHG reducing technologies. This includes modifications to the building code to include provisions for the charging of electric vehicles (such as recharging equipment, as well as the necessary upgrades to the electric wiring), installation of CHP technologies, and streamlining permitting issues for renewable energy technologies such as roof-top solar, solar water-heating, and small-scale wind.

Fortunately, San Francisco has already developed a variety of working groups that have already begun to address such issues as permitting of small-scale wind and solar installations and requirements for recharging electric vehicles. In 2006, for example, the San Francisco Building and Planning Departments developed criteria so solar permits now cost less than $90 and can be issued over the counter, without the delays of in-house reviews. The Building Department estimates that 90 percent of photovoltaic system applications meet the requirements for the streamlined permit process. The Urban Wind Power Task Force has identified similar modifications to address the installation of small-scale wind.[61]

Potential Concerns

- Proposed revisions to Building Code need to be coordinated with available incentives and educational programs

Need for Changes to Existing City Ordinances

- Any changes would be incorporated into periodic updates of the City's Building and Zoning Codes as appropriate.

Next Steps

1. San Francisco should continue updating its own building codes in parallel with changes at the state level to include additional cost-effective energy efficiency as well as tailoring energy efficiency measures to San Francisco's unique climate.
2. San Francisco should adopt energy efficiency programs for existing commercial buildings.
3. San Francisco should evaluate changes to its Residential Energy Conservation Ordinance (RECO).
4. San Francisco should ensure that building codes continue to evolve and be updated to accommodate emerging GHG reducing technologies such as the charging of electric vehicles, roof-top solar, solar water-heating, and small-scale wind.

[60] For example, San Francisco Planning and Urban Research (SPUR) Association proposed updating the program in its Critical Cooling Report (February 18. 2009).
[61] San Francisco Urban Wind Power Task Force and Recommendations (Sept, 21, 2009).

BUILDING STANDARDS
(Applicable RMI Recommendations)

EE – 6	The BoS should consider creating a "retrofit on resale" efficiency ordinance.
RE-9	The Mayor's Office, SFE, and the San Francisco Planning Department should monitor the permitting process to ensure improved efficiency and consistently applied standards for renewable projects
CHP-1	BoS should consider amending the City Green Building Ordinance to include a requirement that a CHP feasibility study be conducted for all new large development projects and major renovations. *NOTE: Also addressed under Community Scale Energy Systems*
CHP-3	SFE should consider offering support services for CHP installation such as publishing a list of qualified CHP suppliers and installation contractors, and assisting CHP owners with the permitting process.
ET-2	The City should continue its efforts to update and streamline the permitting processes to allow for installation of charging equipment. The SFPUC should develop and implement electric vehicle charging deployment guidelines. SFPUC should consider collaborating with PG&E, SFE, and a potential future CCA provider to do this.
ET-3	BoS should consider modifying or amending building codes to require 220-volt outlets installed in public and private garages of new buildings to accommodate PHEV and EV charging infrastructure, or at a minimum require that electrical conduits be installed in order to allow for the installation of 220-volt lines later.

(Applicable Climate Action Plan Recommendations)

3.3 C	Strengthen Legislation, Codes and Standards

(Applicable Peak Oil Task Force Recommendations)

11.4.1	Urges City departments to develop ultra-low energy building standards, consistent with the Passive House standard, and programs which encourage new and remodeled buildings to meet those standards.
11.4.3	Urges City departments to develop programs and incentives to improve energy conservation and efficiency, weatherization, and compliance with other building standards by the City's rental housing stock.
11.4.5	Urges City departments to require that certain energy conservation and efficiency improvements be completed when buildings are offered for sale.

RECOMMENDATION 6 - BACK-UP STORAGE

Promote Back-Up Storage deployment as an alternative to the existing use of diesel-powered back-up generation.

Background

A significant number of buildings and facilities in San Francisco currently have on-site back-up electric generation. This generation is installed to ensure that critical services (such as hospitals and fire stations) can continue to operate during power outages and/or to provide reliable and uninterrupted electric service for such functions as data centers and computer systems. Almost all of these back-up power systems are either diesel or natural gas-powered generators that are typically limited by air quality and City[62] regulations to operating only when actually needed and for necessary testing.[63]

There are several hundred MW of installed back-up generation capacity in San Francisco, equivalent to a medium-sized power plant.

Proposal

San Francisco should examine whether these existing natural gas and diesel back-up generators can beneficially be replaced with electric storage (such as electric batteries), and then networked to provide reliability and environmental benefits to the grid. Converting fossil-fueled back-up generation to electric storage would not only eliminate air pollution emissions from this sector, but also (since there would be no limitations on their use) allow for this electric storage to be used continually around the clock.

Ideally, by networking these electric storage facilities together, building and facility owners would have the certainty of a back-up power supply when needed, while the units could also be integrated into the electric grid to be used when needed to meet system-wide demands. Converting even a portion of these units to a networked electric storage system could provide a convenient source of local electric supply able to be used to meet peak demand and local reliability needs.[64] The ability of electric storage to absorb and discharge electric power quickly also make it an ideal technology to complement renewable energy resources such as wind and solar, whose output can fluctuate significantly both over the course of a day, and sometimes even within the hour.

An advantage to building and facility owners is that it could turn what is now a necessary but largely unproductive asset (the cost of the back-up generator) into a potential profit center as the owner would receive the new revenue stream from providing power and ancillary services to the electric grid from the electric storage unit.

Efforts to develop electric storage in San Francisco could be undertaken in conjunction with the requirements of AB2514 that went into effect in 2011.[65] This legislation requires all public utilities to evaluate the use of electric storage technologies as part of their resource mix and identify cost-effective storage projects for potential development. The CPUC has just opened a proceeding to determine PG&E's requirements under AB2514.

[62] BoS Ordinance 202-02, sponsored by Supervisor Sophie Maxwell, required new back-up generators to have air emission control technologies, limited operation during non-emergency situations, and established reporting and enforcement mechanisms.
[63] Alternatively, many units are limited to operating no more than 100 hours per year.
[64] One of the advantages of electric storage is the ability to store power during off-peak hours when energy costs are lower, and then discharge that power back to the grid during peak times when prices are higher.
[65] Statutes 2010, Ch. 469.

Potential Concerns

- Current costs of electric storage may not be cost-effective for wide-spread use at the present time.
- Ability to network storage units and their operation to achieve large-scale operation needs to be developed.
- Rules under which electric storage could participate and get paid for providing services to the wholesale energy market are still being developed.

Need for Changes to Existing City Ordinances

- If found to be cost-effective, San Francisco could adopt changes to Building and Zoning Codes to encourage use of electric storage as a back-up electric supply and to discourage the installation of new fossil-fueled back-up generation within the City.
- Work with Bay Area Air Quality Management District (BAAQMD) regarding setting of emission limits for back-up generation.

Next Steps

1. Consider and evaluate installation of a pilot electric storage project, perhaps as part of the other recommendations for the San Francisco Green Test Bed (Recommendation #3) and Community Scale Energy Systems (Recommendation #4).
2. Coordinate with implementation of AB2514, which requires public utilities to evaluate the need for cost-effective electric storage technologies.

RECOMMENDATION 7 - IMPLEMENT COMMUNITY CHOICE AGGREGATION (CCA)

Implement Community Choice Aggregation (CCA) to offer more renewable and GHG-free electric supplies to San Francisco residents and businesses consistent with guidance from the Board of Supervisors and LAFCO.

One lever by which San Francisco can influence its energy future is through CCA. As noted in Chapter 3, over 83% of energy used in San Francisco is delivered by either PG&E or direct access service providers. Almost all of this energy is procured from the wholesale energy market. By acquiring the right to directly serve and provide energy to San Francisco residents and businesses, the City can expand its influence the type of energy purchased, create a revenue stream (through the customer's energy bills) to fund the development of renewable energy and energy efficiency activities.

Additionally, San Francisco's CCA provides the City an opportunity to promote and advance customer-side (behind-the-meter) measures including both energy efficiency and development of locally-owned and distributed generation resources. By promoting local measures, CCA offers an added benefit of responding to the City's new policy objectives to encourage and promote local hiring.

CLEANPOWERSF GOALS

- To provide customers with a choice for their electricity supplies,
- To reduce the City's reliance on fossil fuels,
- To reduce pollution and greenhouse gas (GHG) emissions associated with electricity generation necessary to serve San Francisco's residents and businesses,
- To provide electricity supplies at rates that are competitive with PG&E service and to stabilize electricity rates for City residents and businesses enrolled in the program,
- To increase local control over electricity supplies, and
- To increase local green job opportunities.

Since 2002, San Francisco has created a CCA program - CleanPowerSF - and has taken the necessary steps to be able to offer service to customers. BoS Ordinances 86-04, 146-07 and 147-07 established the CCA program at the local level, and the SFPUC has provided $5 million[66] in start-up funding. Pursuant to State law, the City developed a Community Choice Aggregation Implementation Plan and Statement of Intent (the "Implementation Plan") which was certified by the CPUC on May 18, 2010. The City executed a Community Choice Aggregation Service Agreement with PG&E on May 27, 2010 that governs the business relationship between CleanPowerSF and PG&E, which will still provide transmission and distribution services to deliver CCA's energy to its customers.

The goal of CleanPowerSF is to offer an electricity supply portfolio such that by 2021, at least 51% of supplies will be provided by renewable and green resources at prices comparable to PG&E. CleanPowerSF plans to include locally-developed renewable, low GHG and GHG-free resources (including energy efficiency) in its supply portfolio where feasible and cost-effective, and in so doing should serve to directly encourage and facilitate development, financing and construction of local resources.

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[66] At the February 8, 2011, SFPUC Commission meeting, the General Manager was directed to increase the CleanPowerSF's budget by $1 million.

One goal of CleanPowerSF is to offer a portfolio of energy resources that will be 51% renewable by 2021, significantly higher than the 33% that PG&E is expected and required to provide by that time. CleanPowerSF currently has a two-prong approach to acquiring the energy resources need to achieve this goal. To begin operation, it has issued a Request for Proposals (RFP) to identify an energy provider capable of supplying CleanPowerSF with its energy needs. CleanPowerSF is currently in negotiations with a provider identified through the RFP process.

Once operational and receiving a revenue stream from its customer base, CleanPowerSF plans to incorporate locally-developed renewable, low-GHG and GHG-free resources (including energy efficiency) into its supply portfolio where feasible and cost-effective. This action should serve to directly encourage and facilitate development, financing and construction of local resources. Recent guidance from LAFCo directs CleanPowerSF to work with stakeholders to develop a RFP for new renewable and green technology resources, report to the SFPUC by July 2011 and then issue a RFP for these new generation resources.

Throughout both the start-up phase and once the program has been established, CleanPowerSF will be competing with PG&E and other ESPs for customers. To maximize participation in the program and the program's impact on the City's electricity supply portfolio, the program will need to balance numerous trade-offs in terms of costs, renewable and GHG content, price stability for its customers, and other factors.

Potential Concerns

- CleanPowerSF will need to address various implementation issues, identified in its operating plans, in order for CCA to begin operation. CleanPowerSF will be competing with PG&E and other ESPs for customers. To maximize participation in the program and the program's impact on the City's electricity supply portfolio, the program will need to balance numerous trade-offs in terms of costs, renewable and GHG content, price stability for its customers, and other factors.
- CCA customers will be subject to departing load charges or exit fees imposed by PG&E. Under the CCA rules, a customer who chooses to take electric service from CleanPowerSF will pay departing load charges to PG&E to compensate PG&E for its prior investments and contract commitments for electric generation made on behalf of the departing customer. Those charges are currently about 15-20% of PG&E's generation costs.

Need for Changes to Existing City Ordinances

1. None. The establishment, operation, and goals of CCA have been set by BoS Ordinances 86-04, 146-07 and 147-07.

Next Steps

1. CleanPowerSF will continue its efforts to begin offering energy services to San Francisco residents and businesses as soon as practicable.
2. In fiscal year 2010-2011, CleanPowerSF expects to (1) get authorization to negotiate with creditworthy supplier(s), (2) negotiate term sheet(s) with supplier(s), (3) finalize supplier(s)' contract language, (4) seek approval of supplier contract(s) from SFPUC and BoS, and (5) develop opt-out notices and begin marketing to customers.
3. In fiscal year 2011-2012, CleanPowerSF will begin processing opt-out notices and begin serving CCA customers.
4. CleanPowerSF plans to work with stakeholders to develop one or more RFPs for new renewable and green technology resources, including in-City resources, report to SFPUC on status of the RFP process by July 2011, and then issue the first RFP.

5. CleanPowerSF plans to evaluate RFP responses and begin roll-out of new resources to match customer phasing and portfolio requirements.

COMMUNITY CHOICE AGGREGATION
(Applicable Peak Oil Task Force Recommendations)

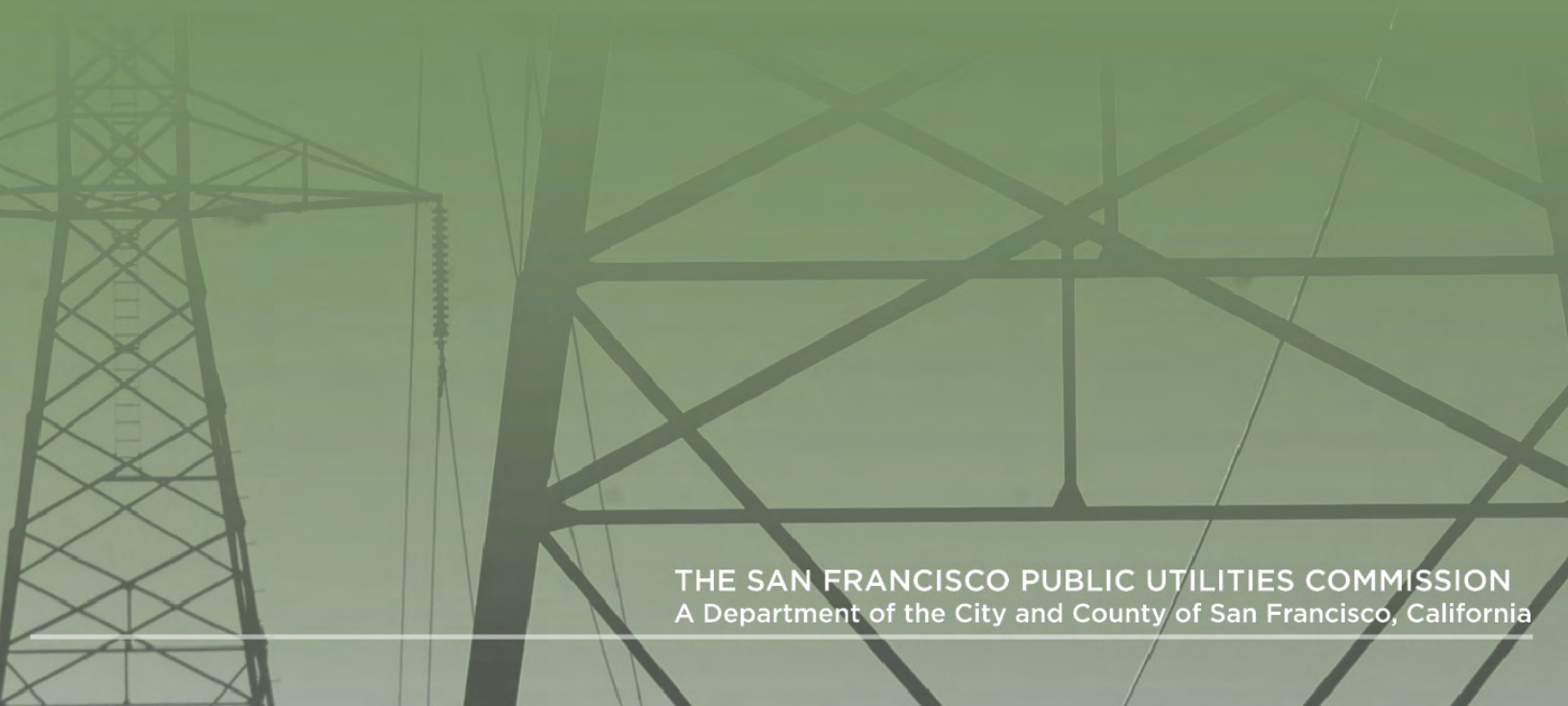
3.4.1	Implement Community Choice Aggregation (CCA)

(Applicable Climate Action Plan Recommendations)

3.4. C	Support and Develop Green Power Purchasing (Including Evaluation of Community Choice Aggregation)

CHAPTER 5

RECOMMENDATIONS THAT EMPOWER SAN FRANCISCO TO INFLUENCE PROCUREMENT OF ELECTRIC RESOURCES AT THE WHOLESALE LEVEL



THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
A Department of the City and County of San Francisco, California

CHAPTER 5 - RECOMMENDATIONS THAT EMPOWER SAN FRANCISCO TO INFLUENCE PROCUREMENT OF ELECTRIC RESOURCES AT THE WHOLESALE LEVEL

This chapter discusses the ability of San Francisco to affect the wholesale procurement choices of PG&E and energy service providers who provide 75% and 8%, respectively, of San Francisco's total electricity needs. Wholesale procurement choices refer to the buying of electricity from the broader Western U.S. electric grid and not just from within San Francisco's boundaries. Absent increased means to influence and affect the procurement choices of PG&E and other energy service providers, it will be difficult for San Francisco to meet its goals of a zero-GHG electric system by 2030.

The recommendations listed in this chapter apply to all of San Francisco's residents, businesses and municipal buildings.

Fortunately, on-going efforts at the state level have significantly increased the percent of renewable energy that these entities will need to acquire. Under CARB's Renewable Electricity Standard (RES), PG&E and energy service providers will be required to meet 33% of their energy needs by 2020 from renewable resources classified as RPS-eligible. The state has also adopted a "cap-and-trade" proposal for carbon emissions that will provide further incentives to reduce GHG emissions associated with electricity generation. Post-2020, it is likely that the state will further increase the RPS standard in order to meet the state's goals of reducing GHG emissions by 80% from 1990 levels by 2020. State efforts to promote energy efficiency and rooftop-solar (through the California Solar Initiative) have also significantly increased since the 2002 ERP.

There are three ways that San Francisco can directly influence wholesale procurement.

First, the City can pursue Community Choice Aggregation (CCA). One of the City's goals for its CCA program, CleanPowerSF, is for 51% of the energy procured by the CCA to come from renewable resources by 2021. This approach is reflected in the two "local control" scenarios modeled in the RMI draft report.[67] The ability of San Francisco to achieve this goal will depend on the resolution of ongoing issues pending before the CPUC that could significantly affect the economic viability of the aggressive CCA program currently envisioned.

Second, San Francisco could advocate for an expanded "green option" for City residents to allow them to choose to procure additional renewable and/or zero-GHG energy through PG&E and/or the CCA. Under this proposal, San Francisco residents could choose to pay an additional premium on their electric bill and the electricity provider (PG&E or CleanPowerSF) would use these funds to purchase additional renewable energy beyond the amounts offered as a standard product.

Third, San Francisco can advocate before the CPUC and FERC, the two regulatory bodies that oversee PG&E, to promote policies, legislation and regulations that will further reduce GHG emissions by increasing the amount of energy efficiency and renewable energy. Both the RMI report and the Green TAC have identified a number of areas where San Francisco should seek to affect state policy as it relates to PG&E.

The RMI draft report also examined the availability and price of renewable resources that are likely to be available in the Western United States energy market. The RMI draft report concluded that significant amounts of renewable energy should be available to meet expected demands at prices not significantly higher than those for conventional

[67] These two scenarios are the Increased Local Control Declining (Technology) Cost and the Increased Local Control Constant (Technology) Cost.

energy sources assuming that renewable energy prices continue to fall. This result is similar to the CPUC's recent report estimating the availability of renewable energy needed to meet a 33% RPS standard, although the CPUC report identified a number of potential transmission and siting problems, not considered by RMI in its report, which could delay the availability and price of renewable energy. Additionally, San Francisco (both the SFPUC and CleanPowerSF) will need to actively compete in this market against numerous other utilities that are also seeking to procure renewable energy to meet their own state-mandated renewable energy targets. Many of these utilities are significantly larger and better funded than San Francisco.

Significance of the Level of Local Control

Meeting San Francisco's energy planning goals, which include a net GHG-free electric system by 2030, presents significant challenges because the City is not currently an electricity portfolio manager on behalf of its citizens. As was the case in RMI's 2002 Electricity Resource Investment Strategy report, the City's influence on energy resource decisions is limited to the following functions:

1. Operation of the Hetch Hetchy hydro system (mostly governed by water supply needs);
2. Serving the energy needs and implementing projects at municipal customers' facilities;
3. Providing marketing and information for residential and commercial energy efficiency programs (in collaboration with PG&E); and
4. Setting local policies and funding incentives.

Thus, implementation of the City's goals under these conditions will require strong cooperation among the City's system of electricity suppliers - SFPUC, PG&E, and direct access providers - as well as private third party developers and investors.

Recognizing these constraints and other factors, San Francisco is actively exploring Community Choice Aggregation as a mechanism to increase the level of local control Community Choice Aggregation would entail the City contracting with one or more energy service providers (ESPs) to procure bulk power supplies. Provision of DSM, green energy and other services that would help fulfill City policy goals could be a condition of the City's contract with an ESP, or they could be acquired separately, leaving the ESP to focus on low-cost power procurement. While CCA meets most of the SFPUC's Power Enterprise guiding principles, the only means to meet all of the SFPUC's Power Enterprise guiding principles for is the City to provide full public power - including distribution services.

The focus and directive of this 2011 Updated ERP is to assess the clean energy options that are technically and economically available to the City to fulfill its clean energy objectives by 2030, and recommend measures that key actors should take to make those objectives achievable. This report remains agnostic about any particular path that San Francisco could or should adopt, as many policy decisions remain that should be left to the citizens and the political process.

RECOMMENDATION 7 - IMPLEMENT COMMUNITY CHOICE AGGREGATION (CCA)

Implement Community Choice Aggregation (CCA) to offer more renewable and GHG-free electric supplies to San Francisco residents and businesses consistent with guidance from the Board of Supervisors and LAFCO.

As noted in Chapter 4, one lever by which San Francisco can influence its energy future is through its CCA program, CleanPowerSF. CleanPowerSF is presented as a recommendation in both Chapters 4 and 5 as it can affect San Francisco's energy choices not only in developing local behind-the-meter resources but also influence the type of energy procured from the broader Western United States energy market.

Chapter 4 focused on how CCA can be used as one measure to promote the development of cost-effective zero- and low-GHG behind-the-meter energy resources within San Francisco.

CCA can also serve as a mechanism to influence procurement choices at the wholesale energy level. This includes the over 83% of energy used in San Francisco that is purchased by either PG&E or direct access service providers for use in San Francisco. Almost all of this energy is procured from the wholesale energy market that covers the entire Western United States. In order to achieve its goals, CleanPowerSF will need to procure energy resources from both within San Francisco and from the broader Western energy markets.

Potential Concerns (as noted in Chapter 4)

- CleanPowerSF will need to address various implementation issues, identified in its operating plans, in order for CCA to begin operation. CleanPowerSF will be competing with PG&E and other ESPs for customers. To maximize participation in the program and the program's impact on the City's electricity supply portfolio, the program will need to balance numerous trade-offs in terms of costs, renewable and GHG content, price stability for its customers, and other factors.
- CCA customers will be subject to departing load charges or exit fees imposed by PG&E. Under the CCA rules, a customer who chooses to take electric service from CleanPowerSF will pay departing load charges to PG&E to compensate PG&E for its prior investments and contract commitments for electric generation made on behalf of the departing customer. Those charges are currently about 15-20% of PG&E's generation costs.

Need for Changes to Existing City Ordinances

1. None. The establishment, operation, and goals of CCA have been set by BoS Ordinances 86-04, 146-07 and 147-07.

Next Steps

1. CleanPowerSF will continue its efforts to begin offering energy services to San Francisco residents and businesses as soon as practicable.
2. In fiscal year 2010-2011, CleanPowerSF expects to (1) get authorization to negotiate with creditworthy supplier(s), (2) negotiate term sheet(s) with supplier(s), (3) finalize supplier(s)' contract language, (4) seek approval of supplier contract(s) from SFPUC and BoS, and (5) develop opt-out notices and begin marketing to customers.

3. In fiscal year 2011-2012, CleanPowerSF will begin processing opt-out notices and begin serving CCA customers.
4. CleanPowerSF plans to work with stakeholders to develop one or more RFPs for new renewable and green technology resources, including in-City resources, report to SFPUC on status of the RFP process by July 2011, and then issue the first RFP.
5. CleanPowerSF plans to evaluate RFP responses and begin roll-out of new resources to match customer phasing and portfolio requirements.

COMMUNITY CHOICE AGGREGATION
(Applicable Peak Oil Task Force Recommendations)

3.4.1	Implement Community Choice Aggregation (CCA)

(Applicable Climate Action Plan Recommendations)

3.4. C	Support and Develop Green Power Purchasing (Including Evaluation of Community Choice Aggregation)

RECOMMENDATION 8 - DEVELOP CITY-OWNED TRANSMISSION PROJECTS

Evaluate and develop new city-owned transmission projects to increase the delivery of Hetch Hetchy and renewable power to San Francisco.

Background

BoS Ordinance 94-09 directed the SFPUC to identify:

> Transmission needs to transport Hetch Hetchy generation and cost-effective clean resources into the City, and alternatives for meeting those needs, including, construction of City-owned transmission lines, contracts or joint transmission projects with other municipalities, and participation in the ISO transmission markets.

This reconfirms the direction the Board previously gave the SFPUC in Resolution 414-07 that directed the SFPUC to study the feasibility of building a transmission line that would connect the SFPUC's Hetch Hetchy generation directly to San Francisco.

Currently, the SFPUC owns and operates two 115 kV transmission lines that run approximately 150 miles from the Hetch Hetchy hydroelectric generation units to PG&E's Newark substation. However, San Francisco does not own any transmission lines connecting from Newark into San Francisco. Instead, PG&E owns all of the high-voltage transmission lines entering the City, with the exception of the TransBay Cable project.

In order to bring its Hetch Hetchy generation from Newark into San Francisco, the City entered into an Interconnection Agreement with PG&E to transmit electric power the remaining 30 miles. For a number of years, extending this transmission line to San Francisco has been proposed, and the issue has been revived given the pending expiration of CCSF's Interconnection Agreement with PG&E in 2015 (See Recommendation #13).

With the retirement of the Hunters Point and Potrero Power Plants, San Francisco will be reliant on power brought into the City over transmission lines to meet almost all of its electricity needs.[68] Building additional transmission capacity into the City would further ensure that there will not be a need for any large-scale, central generation in the City.

Proposal

In response to BoS Resolution 414-07, the SFPUC is currently examining the feasibility of an underwater transmission cable, using the same technology as TransBay Cable, that would run under the Bay from Newark to the Oakland/East Bay, and then over to San Francisco.

The SFPUC is also evaluating upgrading its existing transmission system from Hetch Hetchy to Newark. The City's existing transmission system between Hetch Hetchy and Newark parallels one of the three main corridors for electric energy to enter into the Greater Bay Area, and is the only transmission system in this corridor that is not owned by PG&E.

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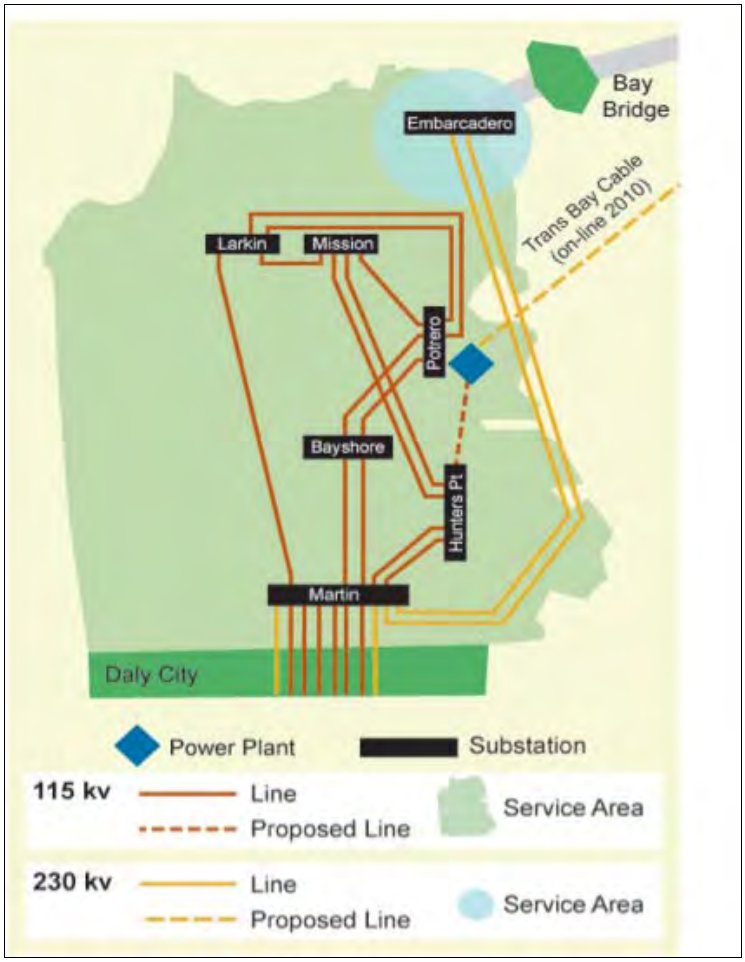
[68] As noted above, there are approximately 30 MW of cogeneration within the City and 13 MW of solar (including the Sunset Reservoir). This compares to a peak demand in San Francisco of 970 MW.

The combined effect of these projects would be to allow San Francisco's Hetch Hetchy power to be directly delivered into the City, as well as increasing the ability of the Greater Bay Area to access renewable energy sources being developed outside the Bay Area, including potential SFPUC renewable projects along the SFPUC's existing right of ways. These projects would also improve the reliability of the transmission system serving San Francisco and the Greater Bay Area.

The SFPUC has retained consultants to evaluate these proposed projects and has requested the California ISO to study these proposals as part of its Transmission Planning Process. The SFPUC is also pursuing partnership and financing opportunities for this project from the Western Area Power Administration (WAPA) and other Bay Area municipal utilities.

Figure 6
SAN FRANCISCO'S TRANSMISSION SYSTEM



Within San Francisco, there are also essentially two different transmission systems. The first is a 230 kV transmission system consisting of two lines that serve PG&E's Embarcadero substation. The Embarcadero substation, in turn, serves the downtown area. The second is a lower voltage 115 kV system that serves the rest of San Francisco.

Although TransBay Cable will improve reliability to the 115 kV system, it will not improve reliability on the 230 kV system that serves the downtown area. Should there be a double outage of both of the existing lines serving the

downtown area about 250 MW of downtown load would be curtailed. This highlights the need to further reinforce the City's existing 230 kV system.

One way to improve the reliability of the 230 kV system would be to add an additional connection to the Embarcadero station. Resolution 414-07 also directed the SFPUC to study the feasibility of a City-owned transmission line to provide additional reliability to the downtown area. This concern is also being addressed in the SFPUC's study of transmission alternatives. PG&E is also proposing to install an additional connection into the downtown area as part of its proposed upgrading and renovation of its Embarcadero substation.[69]

Potential Concerns

- While PG&E owns almost all of the transmission system serving San Francisco, under California's restructuring of the electric industry, PG&E has turned the daily operation and dispatch of its transmission system to the CAISO. The CAISO serves as an impartial "traffic cop" ensuring that all generators and end-use customers (including San Francisco) receive the same "open, transparent, and non-discriminatory access to California's transmission system."[70]

- Project feasibility and financing are currently being evaluated. Technical, financial and/or economic constraints may delay or hinder implementation.

- Construction of these transmission lines will require significant capital investment that the SFPUC will not likely be able to pay for on its own. As these transmission lines will benefit not only San Francisco but also improve reliability and access to renewable energy for the Greater Bay Area, the SFPUC is pursuing funding opportunities with the CAISO, WAPA, and other Northern California municipal utilities.

Need for Changes to Existing City Ordinances

- None. BoS Resolutions 414-07 and 299-08 directed the SFPUC to study the feasibility of new transmission projects to ensure reliability and improve the ability of San Francisco to deliver Hetch Hetchy and renewable power to San Francisco.

Next Steps

1. The SFPUC, with retained consultants, is actively evaluating these proposed projects.
2. The SFPUC has requested the CAISO to study these proposals as part of its Transmission Planning Process.
3. The SFPUC is pursuing partnership and financing opportunities for this project from the WAPA and other Bay Area municipal utilities.

[69] PG&E has proposed this project in its annual proposals to the CAISO as part of its annual Transmission Planning Process. The CAISO did not identify a need for the project in its 2009 Transmission Plan, but PG&E has resubmitted the project for approval. To date, neither the CAISO nor the CPUC has approved the project.

[70] The CAISO, TransBay Cable, and PG&E's transmission services are all subject to FERC regulation.

CITY-OWNED TRANSMISSON
(Applicable RMI Recommendations)

RE-15	SFPUC should complete an evaluation of the cost of a transmission line to bring in renewable power and Hetch Hetchy power directly to the City. This evaluation should assess the costs and benefits of the reduced transmission charges that the City would otherwise have to pay to either PG&E (prior to the expiration of the interconnection agreement (IA) in 2015) or the California ISO (after 2015).
RE-14	SFPUC should explore partnerships with other municipal utilities to evaluate and develop potential renewable energy sites either in close proximity to the City and/or Northern California.

RECOMMENDATION 9 - GREEN PRICING

Develop a "green pricing" option (through CCA and/or PG&E) allowing San Francisco customers to voluntarily commit to purchasing 100% GHG-free energy.

Background

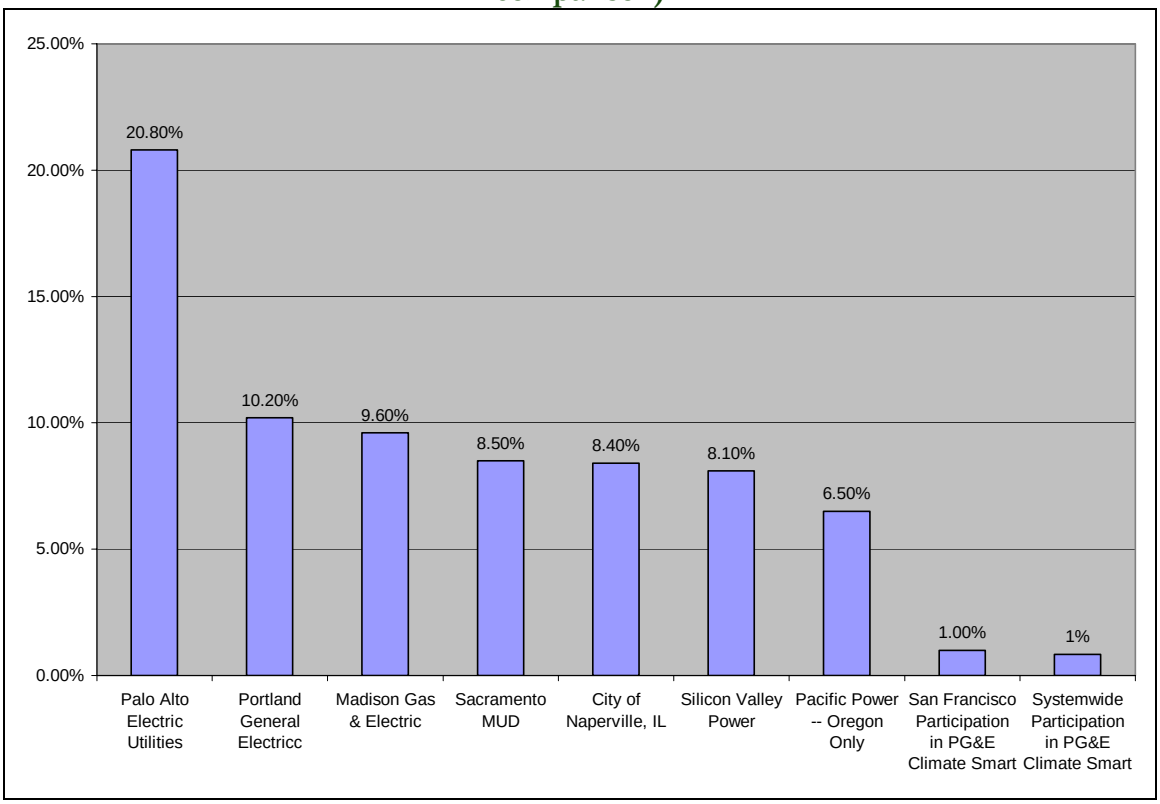
"Green pricing" allows a customer to voluntarily pay a premium above the otherwise applicable electric rate, with the proceeds from the premium being used by the supplier to purchase additional renewable energy. This allows individual San Francisco customers to voluntarily commit to purchasing 100% zero-GHG energy. Many municipal utilities, such as Palo Alto, offer this product. Under Palo Alto's program, customers voluntarily pay an additional 1.5 ¢/kWh on their electric bills with the additional revenue used to purchase renewable energy credits (RECs) to offset the corresponding GHG emissions. The Sacramento Municipal Utility District (SMUD) offers a "solar shares" program where customers voluntarily pay higher rates to purchase a proportionate share of the output from a new solar facility.

PG&E does not currently offer this product but does offer a ClimateSmart program that allows customers to pay extra (about 0.25 ¢/kWh or an average payment of $3.00 per month per participant) to purchase GHG offsets equivalent to the GHG emissions from their energy usage.[71] These offsets tend to come from forest protection and agricultural programs[72] rather than from reduced GHG emissions from electric generation.

To date, only about 3,000 of PG&E's San Francisco customers participate in its ClimateSmart program. Program participation in San Francisco is somewhat higher (about 1%), than PG&E's system-wide participation rate of 0.8%. These figures do not include other voluntary GHG offset programs that businesses and residents can participate in. Other utilities have significantly higher participation rates but also are starting from rates that are significantly below PG&E's rates,[73] thus imposing less of a financial cost on participating customers.

[71] Information and data for PG&E's program is taken from PG&E's 2009 Climate Smart Annual Report (March 10, 2010).
[72] Such as reducing methane emissions associated with dairy operations.
[73] For example, Palo Alto's and Silicon Valley Power's electric rates are about two thirds of PG&E's rates.

Figure 7
GREEN PRICING PARTICIPATION (as % of Customers)
(Top 7 utilities nationwide; PG&E San Francisco and System-wide participation shown for comparison)



SOURCE: National Renewable Energy Laboratory's annual assessment of leading utility green power programs and PG&E 2009 Climate Smart Annual Report.

Proposal

San Francisco should develop a "green pricing" option available for all San Francisco residents and businesses. San Francisco could work with PG&E to make this option available to City residents and businesses or it could be offered as part of CleanPowerSF.

The SFPUC has committed to providing zero-GHG electric energy for all new electric load served at Hunters Point and Treasure Island.

RMI, in its draft report, believes that PG&E will have little incentive to offer such a program in the near-term, as it will be seeking to acquire all possible GHG-free energy to meet its state-mandated RPS goals. Nonetheless, San Francisco should continue to press PG&E to offer this service.

The green pricing option could also be incorporated into the service offerings of CleanPowerSF.

Several variants of this program could be developed, with customers being able to designate some portion of their energy usage greater than the otherwise applicable RPS standard but less than 100% (e.g. a 50%, or 75% option). Another variant could focus on acquiring only in-city renewable energy or as the Sacramento Municipal Utility District (SMUD) offers, an option for customers to purchase a share of a solar facility equivalent to their energy usage. As

noted above, both the pricing and length of commitment to the program need to be sufficient to recover the higher cost of acquiring renewable energy, particularly for any program offered through CleanPowerSF as customers have the option to leave the program if it becomes too expensive.

Potential Concerns

- Willingness of PG&E to offer a green option for its San Francisco customers.
- Pricing and length of commitment to any green pricing program need to be sufficient to recover the higher cost of acquiring renewable energy, particularly for any program offered through CleanPowerSF as customers have the option to leave the program if it becomes too expensive.
- Ability of CleanPowerSF to develop a green pricing option while it is also undertaking numerous other issues associated with its start-uip

Need for Changes to Existing City Ordinances

- None identified.

Next Steps

1. Work with PG&E, and through the CPUC, to encourage PG&E to offer a green option.
2. Incorporate green pricing option into CleanPowerSF's service offereings.

GREEN PRICING
(Applicable RMI Recommendations)

RE-13	PG&E and SFPUC should discuss and develop options for procuring outside city renewable resources for San Francisco in light of meeting California's RPS requirements.
RE-13a	Options include a voluntary green power pricing program where customers pay a premium rate on their bill for additional renewable energy.

(Applicable Climate Action Plan Recommendations)

3.4. C	Support and Develop Green Power Purchasing.

RECOMMENDATION 10 - REGULATORY PARTICIPATION

Participate in regulatory proceedings before the CPUC and FERC to encourage state and federal policies to promote the use of GHG reduction strategies and encourage the development of CCA.

Background

The SFPUC serves as the City's designated expert on energy issues. The SFPUC extensively participates before state and federal regulatory agencies to represent San Francisco's interests, usually in conjunction with the City Attorney. Past examples include advocating for the closure of the Potrero Power Plant, reviewing reliability and cost issues associated with PG&E's provision of gas and electric service to the City, and analysis and advocacy regarding regulatory issues associated with implementing CCA.

Proposal

As noted in Chapter 2, over 80% of San Francisco's electric energy is procured by entities (PG&E and direct access providers) that are regulated by the CPUC. Participation by the City in these proceedings provides an opportunity to encourage regulatory agencies to adopt policies that promote GHG reduction strategies. Participation in PG&E's Long-Term Procurement proceeding and the CPUC's rulemaking on electric vehicle development are two examples.

The CPUC is in the process of developing and modifying the rules that govern CCAs. Major issues still need to be resolved, including the level of exit fees that customers choosing CCA will be obligated to pay to PG&E, limits on PG&E's marketing efforts to prevent customers from choosing CCA, and the ability of a CCA to directly control and utilize the energy efficiency funds currently being collected through a utility's PGC.

Finally, as noted in Recommendation #1, the State Legislature will soon need to reauthorize the state's PGC. This provides an opportunity for the City to advocate both for increased funding for this program as well as increased control of the program's expenditures by the City or independent third party administrators rather than by the utilities.

Potential Concerns

- Intervention in the legislative and regulatory process can be a time-consuming and resource-intensive process without any certainty of results.

Need for Changes to Existing City Ordinances

- None. The City Attorney is already designated to represent San Francisco before regulatory bodies, usually in conjunction with the SFPUC.

Next Steps

1. Identify and prioritize relevant proceedings that have a significant effect on San Francisco and its goals of GHG reduction and devote sufficient resources to participate in these proceedings as necessary.
2. Revisit the City's Loading Order Policy with an emphasis on GHG-reducing resources. Propose changes to the City's Loading Order, as appropriate to ensure the overall goals of this report are aligned with City policies.

REGULATORY INVOLVMENT
(Applicable RMI Recommendations)

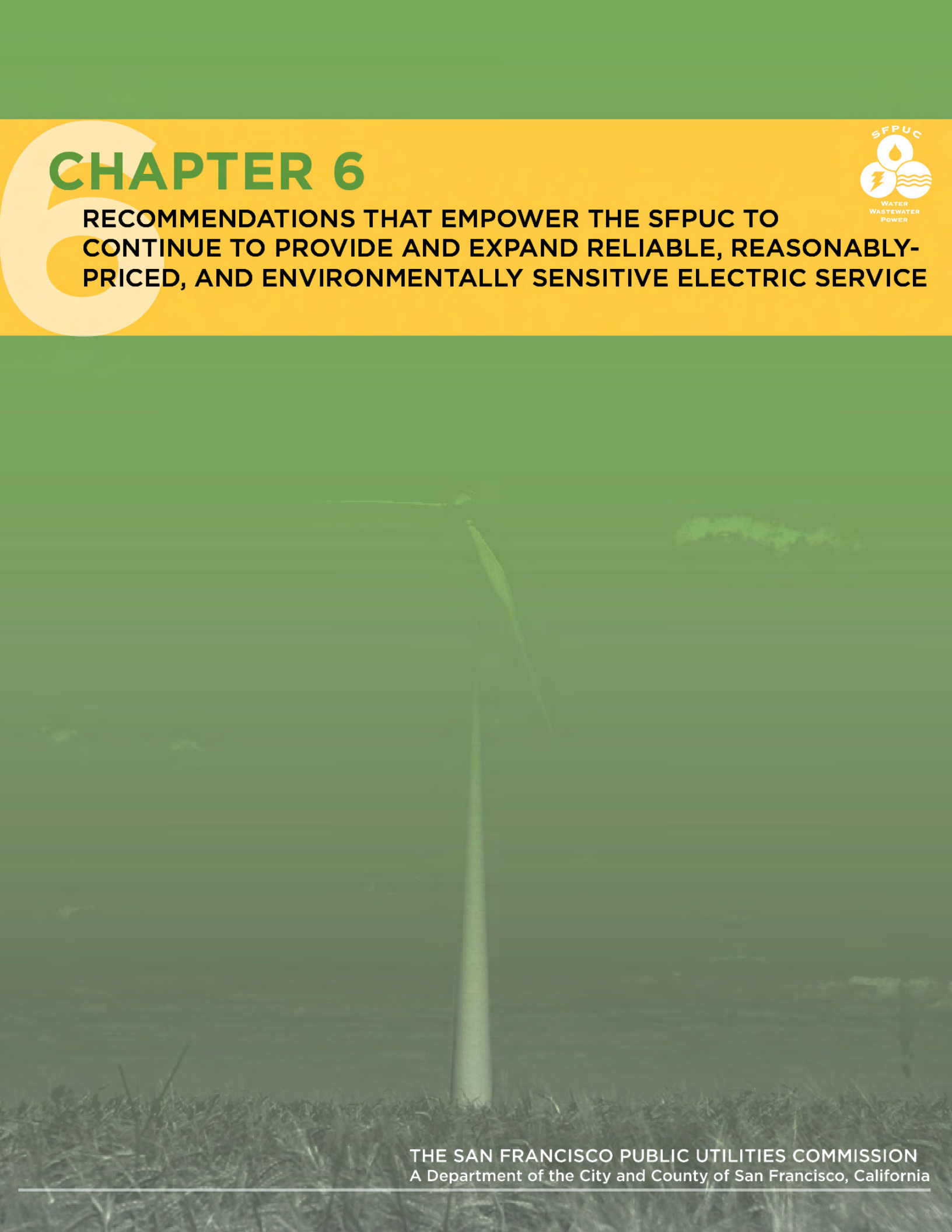
EE – 3	BoS should consider mechanisms for raising additional funds for energy efficiency implementation beyond monies already collected through PG&E's Public Goods Charge and the SFPUC's Sustainable Energy Account (5% of revenues). *NOTE: Also addressed in Energy Efficiency*
EE - 12	The BoS should consider establishing an Efficiency Services Providers steering committee to facilitate a more frequent and consistent exchange of information on best practices, coordination, review and recommend new programs, and establish clear definition of roles. Members of the task force should include PG&E, SFPUC, and SFE, as well as low-income representatives, and efficiency contractors.
RE-4	PG&E should continue to find creative methods for providing critical funding for distributed renewable energy projects that would otherwise have trouble accessing capital markets. *NOTE: Also addressed in Behind-the-Meter*
RE-13	PG&E and SFPUC should discuss and develop options for procuring outside city renewable resources for San Francisco in light of meeting California's RPS requirements. *NOTE: Also addressed in Green Pricing*
RE-13a	Options include a voluntary green power pricing program where customers pay a premium rate on their bill for additional renewable energy. *NOTE: Also addressed in Green Pricing*
ET-4	PG&E should continue to study the interaction between electric vehicles, smart metering, and the smart grid.

(Applicable Peak Oil Task Force Recommendations)

3.4.8	Seek ways to maximize the City's influence on primary energy resource decision-making.

CHAPTER 6

RECOMMENDATIONS THAT EMPOWER THE SFPUC TO CONTINUE TO PROVIDE AND EXPAND RELIABLE, REASONABLY-PRICED, AND ENVIRONMENTALLY SENSITIVE ELECTRIC SERVICE



THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
A Department of the City and County of San Francisco, California

CHAPTER 6 - RECOMMENDATIONS THAT EMPOWER THE SFPUC TO CONTINUE TO PROVIDE AND EXPAND RELIABLE, REASONABLY-PRICED, AND ENVIRONMENTALLY SENSITIVE ELECTRIC SERVICE

Regardless of the energy policies adopted by San Francisco, the SFPUC will remain responsible for providing electric service to municipal facilities. The following recommendations ensure that the SFPUC continues to provide reliable, reasonably-priced, and environmentally sensitive electric service.

Critical to providing reliable service will be developing a rate structure that accurately reflects the cost of providing electric service and enables the SFPUC to be able to utilize long-term financing for its projects.

In order to serve its municipal load, San Francisco entered into an Interconnection Agreement (IA) with PG&E where PG&E transmits Hetch Hetchy electric generation from Newark to municipal loads using PG&E's transmission and distribution system. Under the IA, the SFPUC is limited to providing Hetch Hetchy power almost exclusively to municipal load customers and PG&E has opposed efforts by SFPUC to extend this service to other customers (see Recommendation # 13).

When San Francisco chose to provide electric service to Hunters Point, it needed to take service under a FERC-approved Wholesale Distribution Tariff (WDT) which specifies how San Francisco's distribution system would access to and interconnect with PG&E's system.

RECOMMENDATION 11 - DEVELOP A RATE STRUCTURE FOR THE SFPUC POWER ENTERPRISE

Develop a rate structure for the SFPUC's Power Enterprise that reflects its cost-of-service, promotes the efficient use of energy, and provides the SFPUC with the financial capability to use long-term financing to develop new electricity sources.

Background

The SFPUC provides electric power to all municipal facilities within San Francisco, including the Muni railway, water and wastewater facilities, and San Francisco International Airport and its tenants. The SFPUC also provides electric service to the San Francisco School District and Community College District.

The SFPUC's Municipal customers are classified as either General Fund or Enterprise Fund customers. General Fund customers pay a lower subsidized cost for their electric usage[74] that does not reflect the full cost of producing and delivering the electricity. Enterprise Fund customers pay for power at costs comparable to what PG&E retail customers pay. Enterprise Fund customers thus provide SFPUC with incremental revenue to offset the subsidies provided to General Fund customers, fund necessary upgrades, and the opportunity to implement new City energy projects.

Since General Fund customers pay less than it costs to provide them service, they have less incentive to do energy efficiency programs that otherwise would be cost-effective if they were paying their full cost of service. Additionally, since General Fund rates do not vary by time-of-use (TOU), General Fund customers pay the same rate regardless of whether they are using energy during off-peak or on-peak times, thus muting any incentive to engage in demand response activities or shift energy usage to lower cost time-periods.

Perhaps most importantly, the lack of a clearly defined and enforceable rate structure does not make it possible for the SFPUC to satisfy credit rating agencies as to the certainty of its revenue stream. This precludes the SFPUC from being able to issue long-term bonds in order to finance large capital projects such as new renewable energy facilities and needed maintenance.

SFPUC Power Enterprise Credit Rating Key to Revenue Bond Funding

In 2001, San Francisco voters authorized power bond and borrowing capacity through Propositions B & H as well as in the San Francisco Charter Section 9.107.

The Charter authorization provides for accessing capital project funding for the reconstruction or replacement of existing electric power facilities or combinations of water and electric power facilities under the jurisdiction of the SFPUC, subject to a three-fourths affirmative vote of all members of the Board of Supervisors. Both Propositions B and H allow the SFPUC to access bond financing to be repaid by ratepayers. Bond financing authority is distinctly different than grant funding in that grants are not repaid while funds raised through bond issuances are repaid over time.

Bond financing differs from grants in that grants do not have to be repaid, while bonds are loans that are paid back by ratepayers.

Propositions B & H provided for additional authority for funding renewable energy projects. Specifically, these propositions did the following:

[74] The current cost of power for SFPUC is approximately 9.0 ¢/kWh. The current General Fund electric rate is 3.75 ¢/kWh for most General Fund customers. However, some customers pay nothing.

- Prop B: Authorized issuance of up to $100 million in revenue bonds with Board approval for solar, energy conservation, or renewable energy facilities and equipment. The triggering authorization is limited to having costs that City departments incur over the life of the project being no greater than their costs prior to project implementation, such that bonds can only be repaid by revenues generated or costs avoided by funded projects.

- Prop H: Amended the City Charter to allow renewable energy and energy conservation revenue bonds to be approved by the Board of Supervisors, without voter approval pursuant to Section 9.107.

These propositions provide the SFPUC with flexibility, assuming adequate access to capital markets. A key requirement to accessing capital markets for an entity like the SFPUC Power Enterprise is to have a stand-alone investment-grade credit rating that enables competitively-priced borrowing based on the predictability of Power Enterprise's future revenues. Without a credit rating, the authorization mechanisms of Propositions B and H do not function efficiently, because the cost of borrowing would be imprudently high for an unrated entity.

The SFPUC has been working to create the conditions necessary for the Power Enterprise to get a stand-alone credit rating and is currently on course to have this credit rating by FY 2011-12. To achieve an investment-grade rating, it is recommended that the Power Enterprise have at least two years of audited financial statements. During FY 2009-10 the Hetch Hetchy Water & Power operations were disaggregated into their two component parts: 1) Hetch Hetchy Water and 2) Hetch Hetchy Power. Separate, audited financial statements enable rating agencies and potential lenders to independently evaluate the creditworthiness of the SFPUC Power Enterprise.[75]

In addition to audited financial statements, the SFPUC has also developed for the Power Enterprise a 10 Year Capital Improvement Plan, a 10 Year Financial Plans, and a Long-Term Strategic Plan. These items are reviewed by credit rating agencies as part of their evaluation of any entity issuing bonds. The SFPUC has successfully completed all of these plans and updates them annually as part of the budget cycle.

Other completed actions to facilitate the Power Enterprise's access to capital markets include the following:

- Completion of an updated Revenue Requirement Model, incorporated into the adopted 10 Year Capital Plans and projected power demands;
- Completion of the entire Rate Fairness Board (RFB) briefing and deliberation process regarding Power Enterprise's operations, financial projections and rates. The RFB provided its report on Power Enterprise's proposed Public Power Redevelopment Area retail rates to the SFPUC in January 2011;
- Completion of Power Enterprise's Electricity Retail Rates Study, and SFPUC's approval of retail rates in February 2011; and
- Holding over ten meetings and discussions with investment bankers regarding financing options for Hetch Hetchy Power, associated capital needs, and financial constraints.

Solid progress has been made toward obtaining an investment-grade rating to allow for issuance of revenue bonds through the capital markets for the Power Enterprise. The SFPUC continues to look for funding opportunities though other types of bond issuances including Clean Renewable Energy Bonds and Qualified Energy Conservation Bonds. On both of those fronts, the SFPUC has been successful in procuring $6 to $8 million in bond allocations; however, the need is much larger so revenue bonds must play a role.

[75] These audited financial statements online at:
https://infrastructure.sfwater.org/fds/fds.aspx?lib=SFPUC&doc=630585&data=242775225

The SFPUC is currently on course to secure a stand-alone credit rating for the Power Enterprise by FY 2011-12. This should enable revenue bond borrowing for key capital projects, including the reconstruction and replacement of existing electric power facilities and the construction of new renewable energy generation.

Proposal

The SFPUC Power Enterprise should establish a Rate Reform Plan that proposes a new ratemaking structure and process that satisfies credit rating requirements and supports the agency's energy efficiency and renewable energy goals. Once a credit rating can be obtained, Power Enterprise finance renewable projects with revenue bonds and blend these costs into its rate base.

Potential Concerns

- Past efforts to move rates for General Fund customers to rates based on cost-of-service have yet to be successful.
- The current City budget crisis may make it more difficult to implement cost-of-service rates for General Fund customers.

Need for Changes to Existing City Ordinances

- None. BoS Resolution 431-04 already establishes the policy that San Francisco should "…transition to annually appropriate funds for each General Fund department sufficient to compensate HHWP for all electricity sales to such departments at a rate that reflects the same cost principles as outlined in the City Charter (Sec. 8B.125, Rates)."

Next Steps

1. SFPUC is undertaking the necessary cost-of-service studies, begun to develop rates, and will seek Board approval to implement changes.
2. SFPUC is working to secure a stand-alone credit rating for the Power Enterprise by FY 2011-12, which will enable revenue bond borrowing for key capital projects including the reconstruction and replacement of existing electric power facilities and the construction of new renewable energy generation.

SFPUC RATE STRUCTURE
(Applicable RMI Recommendations)

EE - 8	SFPUC and BoS should consider developing a new rate structure that encourages efficiency investment by setting rates at cost, making enterprise customers revenue neutral for energy efficiency improvements, and using TOU rates.
RE-1	The SFPUC Power Enterprise should establish a Rate Reform Plan that proposes a new ratemaking structure and process that satisfies credit rating requirements and supports the agency's energy efficiency and renewable energy goals. Once a credit rating can be obtained, Power Enterprise can bond finance renewable projects and blend these costs into its rate base.

RECOMMENDATION 12 - INCREASE THE USE OF MUNICIPAL LOAD TO DISPLACE FOSSIL FUEL USE

Increase the use of municipal load electric energy from Hetch Hetchy to displace fossil-fuel use (e.g. shoreside docking, electric buses and light-rail vehicles, and recharging electric vehicles in City-owned parking lots).

Background

Another issue the SFPUC must address is the effect of the Raker Act on the SFPUC's efforts to promote energy efficiency and renewable energy projects for municipal facilities. Under the provisions of the Raker Act of 1913, which authorized construction of the Hetch Hetchy system, as well as associated contractual commitments, electrical generation from the Hetch Hetchy system is used first to serve San Francisco municipal loads, and then is sold at cost to meet the agricultural pumping and municipal needs of the Modesto and Turlock Irrigation Districts (MID and TID).[76] Any excess power can be sold to public power agencies, although in practice, much of this power is sold to MID and TID at market prices. In the case of MID, it has a contractual right until 2015 to designated portions of this excess power at market-based prices.

As a result of the Raker Act, in many cases, if the SFPUC reduces its municipal load (through such activities as energy efficiency or renewable energy), the displaced Hetch Hetchy power must be made available at cost to MID and TID. A study in 2007 determined that for each 1 MWh the SFPUC saved, approximately half of the saved Hetch Hetchy power was consumed by MID and TID.

Proposal

To preserve the benefit of energy efficiency savings and renewable energy development at municipal facilities for the City's municipal loads, one option, also recommended by the Green TAC, is to identify new uses for Hetch Hetchy power that both qualify as municipal load and have GHG-reduction benefits. The SFPUC's recently-completed shoreside power facility at Pier 27 is an example of providing electric power to cruise ships docking in San Francisco, thereby allowing them to shut down their on-board, much higher-polluting fossil-fueled generators that they would otherwise use when they are in port. Increased use of electric vehicles by the City, increased electrification of the City's transit fleet, as well as increased deployment of electric charging stations in City-owned parking lots are other examples.

Potential Concerns

- These approaches must comply with Raker Act and other contractual obligations are maintained.

Need for Changes to Existing City Ordinances

- None.

Next Steps

1. SFPUC should continue to identify and develop opportunities that allow it to grow its municipal load by displacing the inefficient use of fossil fuels through such activities as shore side docking, increased

[76] The SFPUC also provides electric service to the Riverbank Army Ammunition Plant, a former military facility currently scheduled for closure and potential conversion to non-military uses.

electrification of the City's transit fleet, and electric vehicle recharging at City-owned parking lots and facilities.

USE MUNICIPAL LOAD TO DISPLACE GHG EMISSIONS
(Applicable RMI Recommendations)

EE - 9	SFPUC should consider conducting a follow-on study to better understand the effect of freeing up more Hetch Hetchy power through energy efficiency investment in General Fund customers.
RE-2	SFPUC should actively explore renegotiating the contractual power agreements with MID and TID when they expire in 2015 to ensure that renewable power does not displace San Francisco's municipal load, effectively banking Hetch Hetchy power.

RECOMMENDATION 13 - RENEGOTIATE THE INTERCONNECTION AGREEMENT

Renegotiate the Interconnection Agreement (IA) with PG&E that governs the transmission and distribution of Hetch Hetchy electricity to San Francisco that expires after June 2015.

Background

As noted in Recommendation #8, the SFPUC does not own any transmission lines connecting into the City. Instead, the SFPUC must rely on PG&E to transmit Hetch Hetchy power from Newark, where San Francisco's transmission line ends, to San Francisco. PG&E also provides distribution service, allowing for Hetch Hetchy power to be delivered within the City and to municipal locations outside the City such as the Airport and various water facilities.

These services are provided by PG&E to the SFPUC under a FERC-approved IA that was entered into in 1987 and will expire after June 2015.

Prior to that time, the SFPUC will need to either renegotiate a new agreement with PG&E or identify alternative providers of these services.

Proposal

SFPUC has begun to identify options, legal issues, and strategies to guide it in renegotiating the IA and/or alternative service arrangements.

For transmission services, the SFPUC could rely on taking service from the CAISO. With the restructuring of the California electric market, the CAISO is responsible for the scheduling and use of transmission lines throughout much of California. Although PG&E and TransBay Cable own the transmission lines serving San Francisco, it is the CAISO that now controls their use and scheduling. The CAISO offers this service on an open non-discriminatory basis.

Under this option, the SFPUC could utilize CAISO transmission service to deliver Hetch Hetchy power from Newark to San Francisco. This is likely to be more expensive, as the current transmission rate under the IA is approximately 60% of the current ISO transmission rate ($6/MWh vs. $11/MWh). As new transmission lines are added to the CAISO system to accommodate the delivery of renewable energy into the grid, these rates are expected to rise even higher, perhaps in the range of $14/MWh to $15/MWh by 2015. Thus, while the SFPUC will be able to have its power delivered to meet its municipal needs, it may incur significantly increased costs to do so.

Under the IA, PG&E also provides distribution service to serve municipal load. The SFPUC will have to renegotiate the provision of this service from PG&E, perhaps through a Wholesale Distribution Tariff with PG&E or through other legal or contractual arrangements.

Potential Concerns

- Compliance with the Raker Act and other contractual obligations must be maintained.

Need for Changes to Existing City Ordinances

- None.

Next Steps

1. SFPUC should continue to identify options, legal issues, and strategies to guide it in renegotiating the IA and/or alternative service arrangements.

RECOMMENDATION 14 - IMPLEMENT ENVIRONMENTAL JUSTICE & COMMUNITY BENEFIT PROGRAMS

> Continue to implement the SFPUC's recently adopted Environmental Justice and Community Benefits policies.

The 2002 ERP identified among its major goals the "Support of Environmental Justice" and to "Promote Economic Opportunities." The closure of the Hunters Point and Potrero Power Plants represent an achievement of the goal of environmental justice. Other City energy actions, such as targeting low-income housing projects for energy efficiency efforts and offering enhanced incentives under the GoSolarSF program for solar installations in economically disadvantaged communities are other examples of these efforts. As noted in Recommendation # 2, $2 million of the funds that San Francisco will receive from TransBay Cable as part of its licensing agreement with the City to lease Port property and right-of-ways needed for the project will be set aside for use by the Mayor's Office of Economic and Workforce Development on "green jobs training and placement programs which benefit low-income, at risk, and environmentally disadvantaged communities."[77]

In order to formalize its commitment to environmental justice, the SFPUC has adopted an Environmental Justice policy. In this policy the SFPUC:

> …Affirms and commits to the goals of environmental justice to prevent, mitigate, and lessen disproportionate environmental impacts of its activities on communities in all SFPUC service areas and to ensure that public benefits are shared across all communities. The SFPUC defines environmental justice as the fair treatment of people of all races, cultures and incomes, and believes that no group of people should bear a disproportionate share of negative environmental consequences resulting from the operations, programs and/or policies of the SFPUC.

Following up on this initiative, the SFPUC has also adopted a Community Benefits policy in January 2011 to ensure that SFPUC actions take into account their effect on adjoining communities and that the SFPUC promote economic development.

Potential Concerns

- None identified.

Need for Changes to Existing City Ordinances

- None at this time.

Next Steps

1. Ensure policy is implemented and enforced going forward.
2. Develop policies to allocate TransBay Cable funds allocated to the Mayor's Office of Economic and Workforce Development.

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[77] BoS Resolution 414-07. The Resolution also directs that "Prior to allocating these funds the [Mayor's] office should consult with appropriate City Departments, and community members, including the Power Plant Task Force, in determining how to allocate the funds."

(Applicable Peak Oil Task Force Recommendation)

3.4.5	Advance a Green Jobs workforce development program.

SFPUC COMMUNITY BENEFITS POLICY
(Resolution 11-008, adopted January 11, 2011)

The SFPUC will devote sufficient resources and authority to SFPUC staff to achieve outcomes including:

1. Stakeholder and community involvement in the design, implementation and evaluation of SFPUC programs and policies;
2. Workforce development, including coordination of internal and external workforce programs and strategic recruitment, training, placement, and succession planning for current and future SFPUC staff to ensure a skilled and diverse workforce;
3. Environmental programs and policies which preserve and expand clean, renewable water and energy resources, decrease pollution, reduce environmental impacts, and reward proposals for innovative and creative new environmental programs;
4. Economic development resulting from collaborative partnerships which promote contracting with local companies, hiring local workers, and providing efficient, renewable energy at reduced costs;
5. Support for arts and culture related to the SFPUC's mission, goals and activities;
6. Educational programs;
7. Use of land in a way that maximizes health, environmental sustainability and innovative ideas;
8. Diversity and inclusion programs and initiatives;
9. In-kind contributions and volunteerism; and
10. Improvement in community health through SFPUC activities, services and contributions

ADDENDUM - INCORPORATING GHG GOALS INTO THE SEWER MASTER PLAN

Although the primary focus of this report is on electric usage within San Francisco, Section 907(c) of the Environment Code, adopted by the Board of Supervisors in Ordinance 81-08 directs the SFPUC to integrate into its Sewer Master Plan the GHG goals of Ordinance 81-08.

The SFPUC is currently in the process of updating its Sewer Master Plan, having held extensive outreach and public hearings. Included in the background material prepared for these workshops, the SFPUC has evaluated GHG emissions for the proposed project through Technical Memorandum 804. This report "provides the GHG emissions estimates, assumptions, and configurations for the four alternatives [for the project] evaluated in October 2007 and for the baseline and preferred configuration evaluated in November 2008."

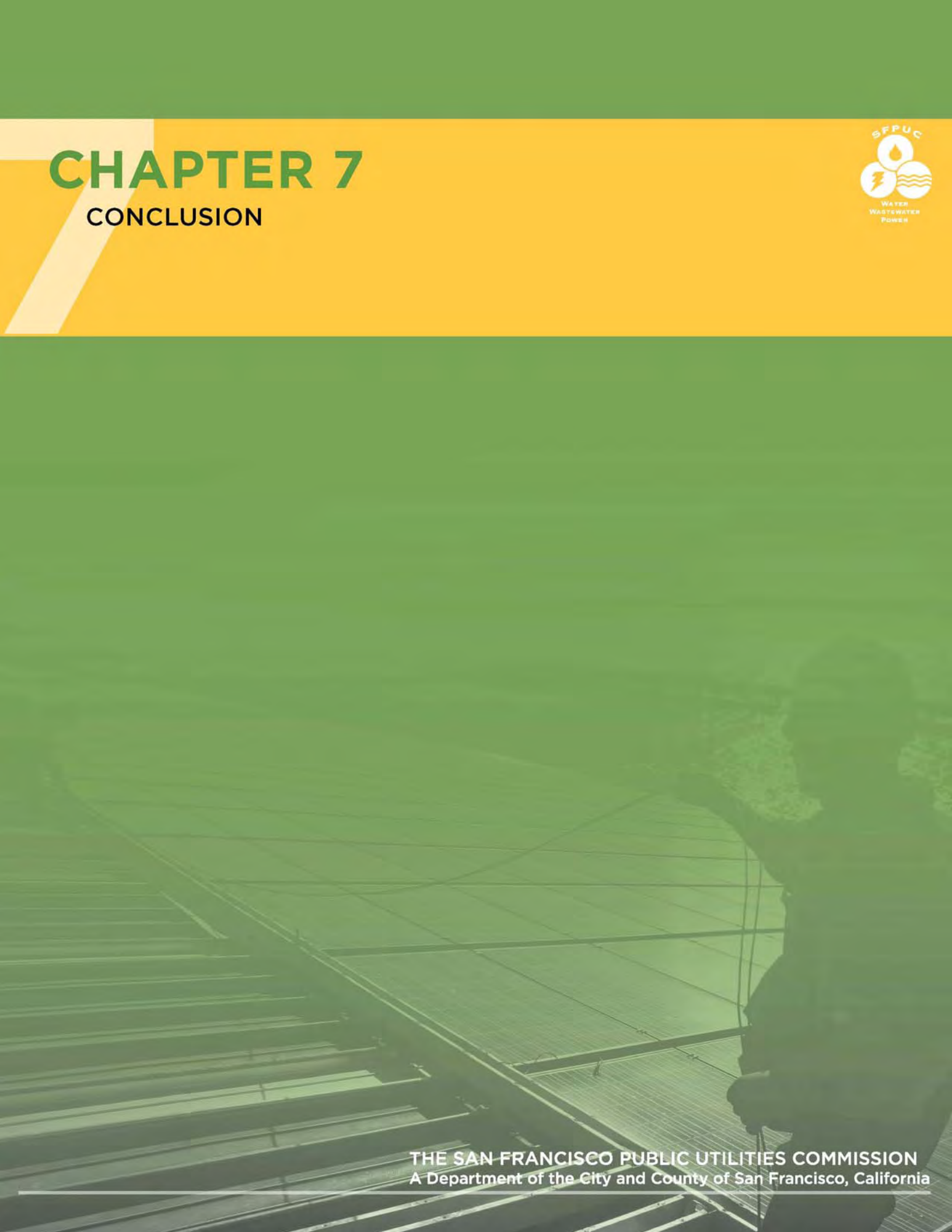
Included in this analysis were GHG emissions from:

- Wastewater collection system and effluent pump stations,
- Wastewater liquids treatment processes,
- Wastewater biosolids treatment processes,
- Biosolids hauling to disposal sites (but not the GHG emissions from disposal), and
- Chemical production and transport to the treatment facilities.

Under the preferred alternative for the project, GHG emissions would be 17,500 tons per year, which is below the baseline estimate of 18,400 tons per year. The bulk of emissions associated with the project are associated with the production of chemicals used in the water treatment process (7,000 tons) and the transportation of these chemicals as well as biosolids produced by the project (8,400 tons). Only about 20% (3,300 tons) of the emissions are associated with electric generation used by the project.

Several elements of the Sewer Master Plan that were not modeled are likely to have a positive effect on GHG emissions. The current diversion from the sewer system of fats, oils, and greases has allowed for these waste products to be converted to bio-diesel to help power the City's vehicle fleet. Bio-gas facilities at both the Southeast and Oceanside plant can use methane generated from the processing of sewage to generate electricity.

CHAPTER 7
CONCLUSION



CHAPTER 7 - CONCLUSION

In the chapters above, the 2011 Updated ERP provides three broad strategic initiatives to move San Francisco toward a zero-GHG electric system by 2030.

Achieving the additional GHG reductions needed to reach this goal will require not just continued, but significantly expanded, efforts - not only by San Francisco but also by state and federal actions. As the 2002 ERP stated:

> Implementation of the Plan will require the cooperation of many organizations, including but not limited to the California Public Utilities Commission (CPUC), the California Independent System Operator (CAISO), the California Energy Commission (CEC), the California Power Authority, Pacific Gas and Electric Company, independent power developers, energy service companies and other departments and agencies of the City and County of San Francisco. (Preface, p. iii)

Each of the three broad strategies outlined in this report targets a specific sector of San Francisco to make its contribution towards the zero-GHG goal.

The first strategic initiative seeks to empower San Francisco's citizens and businesses to take more direct control of their energy destiny by investing in energy efficiency and on-site renewable and distributed generation. To assist San Franciscans in this effort, it will require funding opportunities, long-term financing, and educational/outreach efforts. The 2011 Updated ERP seeks to identify these resources and the mechanisms to make them available. In doing so, San Francisco should benefit from the associated local economic benefits and job creation.

The second strategic initiative recognizes that San Francisco's energy system is part of a far larger electric grid that spans the entire Western United States and that state and federal regulations significantly pre-empt San Francisco's ability to directly regulate this sector. The decision-making authority for over 80% of San Francisco's energy needs is currently made by PG&E and the energy service providers. The 2011 Updated ERP identifies mechanisms for San Francisco to increase its control and influence over these decisions - both directly through Community Choice Aggregation and indirectly through participation in the regulatory and legislative process that oversees these procurement decisions. Community Choice Aggregation can be a major catalyst in increasing San Francisco's control over its energy future.

The third strategic initiative focuses on the SFPUC itself, in its ongoing role of providing electric service to San Francisco's municipal facilities. The 2011 Updated ERP identifies actions that will strengthen SFPUC's Power Enterprise long-term financial health, navigate the transition away from the SFPUC's extensive reliance on PG&E (under the Interconnection Agreement) to transmit and distribute Hetch Hetchy power to San Francisco, and to reaffirm the SFPUC's on-going commitment to environmental justice and community benefits.

Individually, each of the fourteen recommendations outlined in this report are insufficient for San Francisco to achieve its goal. However, taken together they can move San Francisco significantly forward towards its goal of a zero-GHG electric system by 2030.

This 2011 Updated ERP, similar to the original 2002 ERP, should be considered a living document, setting the broad goals for San Francisco to reduce greenhouse gas emissions and identifying opportunities. For each of the recommendations outlined, significant work remains to be done and the scope of the recommendations may evolve over time as conditions change. The associated timelines and next steps outlined in the 2011 Updated ERP represent the roadmap toward San Francisco achieving its goal.

APPENDICES

THE SAN FRANCISCO PUBLIC UTILITIES COMMISSION
A Department of the City and County of San Francisco, California

APPENDIX 1 - FORECAST OF SAN FRANCISCO GHG EMISSIONS BETWEEN 2010 AND 2030

GHG emissions from the electric sector represent about one quarter (24%) of San Francisco's total GHG emissions (1.7 million tons out of 7 million tons) with transportation responsible for about one half (53%) of total emissions and natural gas and steam usage accounting for the remainder (24%).

GHG emissions from the electric sector have fallen 20% from 2008, while City-wide emissions have fallen 6% during the same time frame.

As part of their draft report, RMI forecasted GHG emissions from the electric sector from 2010 to 2030 under a "Business as Usual" scenario.

Under RMI's methodology, which is similar to that used by San Francisco's Climate Action Plan, it is assumed that all in-city electric generation is assigned to meeting San Francisco's energy needs, with the remaining needs being met by the proportionate resource mix of San Francisco's energy providers (e.g. PG&E, SFPUC, and direct access providers). Under this methodology, all of the GHG emissions from the Potrero Power Plant are assigned to San Francisco.

As noted in Chapter #3, the resource mix for the SFPUC is forecasted as coming from 100% GHG-free Hetch Hetchy and renewable resources. PG&E has a current resource mix of that includes 14% renewable, 16% hydroelectric, and 22% nuclear. The mix of energy resources used by direct access providers is not readily available but tends to mirror the resource mix of the broader Western energy market.

Figure 8 shows the level of GHG emissions forecasted by RMI for the electric sector under its "Business as Usual" scenario. For comparison purposes, a trend line is superimposed upon RMI's forecast showing the downward trajectory and yearly reductions that would be needed to reach zero-GHG electric system by 2030.

As shown in Figure 8 below, the closure of the Potrero Power Plant in 2011 should reduce GHG emissions from San Francisco's electric sector by almost 25% from 1.7 million tons per year to 1.25 million tons as higher-polluting generation from Potrero is replaced by cleaner imported power. For comparison purposes, the 2002 ERP forecasted GHG emissions from the electric sector to be in the range of 1.7 to 2.2 million tons in 2011 (depending upon which of the three scenarios were used in the 2002 ERP).[78]

As noted in Chapter #5, PG&E and the energy service providers will be required to meet 33% of their energy needs from RPS-eligible renewable resources by 2020. RMI's analysis assumes successful implementation of California's 33% RPS requirements by 2020. Achieving this goal would further reduce GHG emissions from the electric sector to 1 million tons by 2020. This is a 40% drop from 2008 levels.

Post-2020, the RMI draft report forecasts increasing GHG emissions from the electric sector. This is due solely to continued load growth (forecasted at 1.3%).

A more likely scenario, however, is that GHG emissions associated with the electric sector will continue to fall to somewhere around 600,000 tons by 2030. This is due to the following.

First, the RMI forecast was performed prior to the CARB's adoption of its "cap-and-trade" proposal in December, 2010. Under this proposal, CARB will issue a set number of allowances each year with each allowance allowing for the emission of one ton of GHG. Between now and 2020, the number of allowances issued each year will

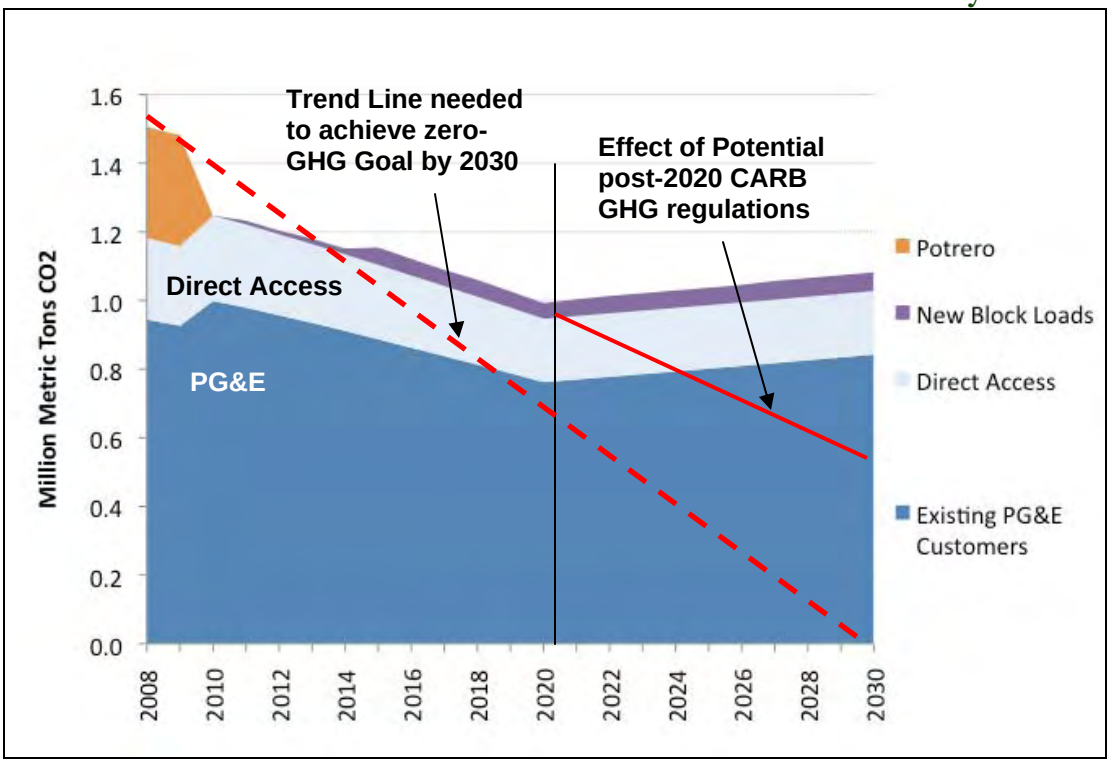
[78] Energy Resource Investment Strategy for San Francisco, (January, 2002) p. 46-48 prepared by the Rocky Mountain Institute.

progressively decline. This will require emitters of GHG to reduce their operations, operate more efficiently thus reducing GHG emissions per unit of output, or purchase allowances from another party with excess allowances. For the electric utility sector, the number of allowances issues will decline by about 16% between 2012 and 2020. This is expected to raise the cost of electric energy generated from fossil fuels by $15 to $30 per MWh depending upon the allowance price and fuel source.

It is assumed that the cap-and-trade program will primarily affect electric utilities that use significant amounts of coal-fired generation, something that neither the SFPUC nor PG&E typically rely on for meeting their energy needs. Direct access providers, however, who purchase significant amounts of energy from the broader Western energy market, will likely be affected and will need to take action to reduce their GHG emissions.

Second, as a Business-as-Usual forecast, RMI assumed no further actions at the state level to reduce GHG emissions post-2020. Thus the forecast does not include any additional post-2020 GHG reductions from either further tightening of California's cap-and-trade program or further increases in post-2020 California's RPS standards. These are both actions that CARB has identified as potential next steps. As CARB has noted in its AB32 Scoping Plan, it is likely to consider the possibility of further raising the RPS requirement post-2020, perhaps to 50%, in order to continue to make progress towards AB32's long-term goal of an 80% reduction in GHG emissions by 2050. CARB has also proposed that it could continue to further ratchet down the number of allowances available under its cap-and-trade program, thus providing further incentives to shift away from fossil fuel use towards renewable and zero-GHG generation.

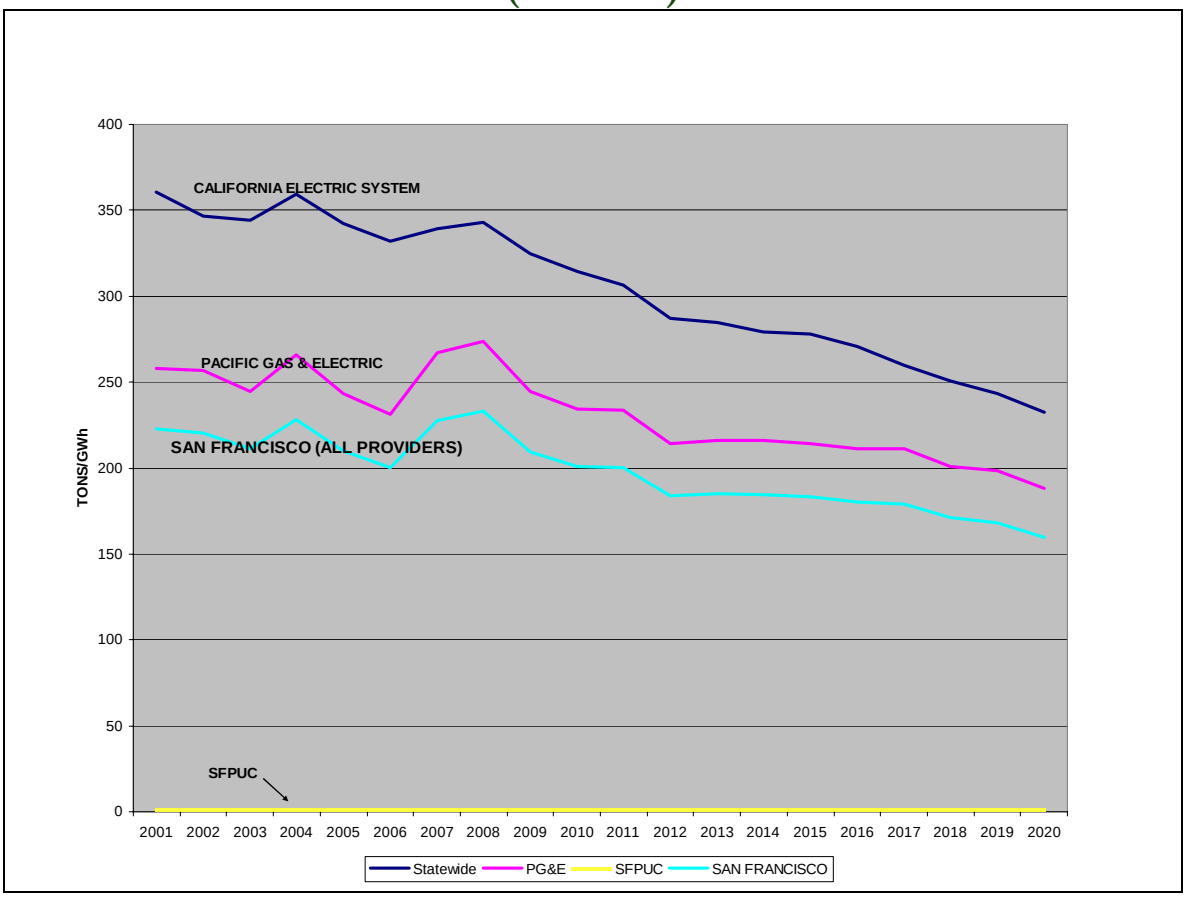
Figure 8
Business as Usual Emissions in San Francisco's Electric System



SOURCE: RMI Draft Report, Page ES-3
NOTE: SFPUC GHG emissions are forecasted to be zero by RMI

The California Air Resources Board has also begun to forecast estimated reductions in GHG emissions from the electric sector that attempt to incorporate the combined effect of RPS compliance and cap-and-trade regulations. Although the data is preliminary, it shows a similar trend to RMI's forecast, with the GHG intensity of San Francisco's electric system (e.g. how much GHG is emitted per GWh of electric production) falling by about 30% between 2011 and 2020.

Figure 9
California Air Resources Board
Forecast of GHG Emissions per GWh of Electric Generation
(2011-2020)



SOURCE: CARB for California and PG&E GHG trends; SFPUC for SFPUC emissions and San Francisco (All Providers)

APPENDIX 2 - RECOMMENDATIONS OF THE ROCKY MOUNTAIN INSTITUTE FOR THE CITY OF SAN FRANCISCO

The following recommendations to reduce GHG emissions in San Francisco are summarized from RMI's draft report: "A Greenhouse Gas Free Electric Strategy for City of San Francisco - Electric Resource Plan Update" prepared in May, 2010.

ENERGY EFFICIENCY

ENERGY EFFICIENCY - GENERAL RECOMMENDATIONS

NUMBER	RECOMMENDATION
EE – 1	PG&E and SFE should use consistent methodologies for tracking the progress of efficiency programs such as required by AB2021.
EE – 2	BoS should develop incentives for all electric service providers for exceeding efficiency targets.
EE – 3	BoS should consider mechanisms for raising additional funds for energy efficiency implementation beyond monies already collected through PG&E's Public Goods Charge and the SFPUC's Sustainable Energy Account (5% of revenues).
EE - 4	SFPUC and SFE should consider conducting a city-wide energy usage survey to better understand San Francisco's unique geography, climate, population mix, and historical building stock High Portion of Multi-Unit Property in San Francisco.

ENERGY EFFICIENCY - MULTI-UNIT STRUCTURES

In San Francisco, buildings with two or more units comprise more than 60% of all residential buildings, compared to 25% state-wide. Additionally, 65% of the housing stock is renter-occupied, and commercial space is typically tenant-occupied.

NUMBER	RECOMMENDATION
EE – 5	The residential and commercial consumption surveys and efficiency potential studies recommended above by SFPUC and SFE should include information collected on rental property versus owned property.
EE - 6	The BoS should consider creating a "retrofit on resale" efficiency ordinance.
EE - 7	SFE and SFPUC should consider a coordinated program to solicit and encourage efficiency investment by energy services companies (ESCOs).[79]

ENERGY EFFICIENCY - MUNICIPAL BUILDINGS

Existing rate structures for municipal accounts are not designed to motivate efficiency with. General Fund customers, such as the City Hall and Public Library paying a flat rate for electricity provided by SFPUC from $0.00 to $0.0375/kWh, below its delivered cost. This low rate dampens conservation behavior and makes it more challenging from a payback perspective to adopt aggressive energy efficiency.

NUMBER	RECOMMENDATION
EE - 8	SFPUC and BoS should consider developing a new rate structure that encourages efficiency investment by setting rates at cost, making enterprise customers revenue neutral for energy efficiency improvements, and using TOU rates.
EE - 9	SFPUC should consider conducting a follow-on study to better understand the effect of freeing up more Hetch Hetchy power through energy efficiency investment in General Fund customers.

[79] ESCOs are an established industry in the U.S., consisting of private-sector companies that develop, install, maintain, and arrange financing for energy efficiency projects in facilities. The ESCO model differs from conventional contractors or consultants in that their compensation is directly linked to the amount of energy that is saved - called performance contracting. There are several different models of performance contracting, including shared savings, where the building owner pays for the efficiency project out of a portion of the energy saved.

ENERGY EFFICIENCY - LOW-INCOME CUSTOMERS

A significant number of residential renters in San Francisco are low-income households. About 30% of households have annual incomes of less than $30,000. Challenges to implementing efficiency in low-income households relate to access to capital and access to information. There can often be communication barriers if the occupants are non-English speakers. This segment represents a particularly hard to reach market for efficiency outreach and program implementation.

NUMBER	RECOMMENDATION
EE - 10	SFE and SFPUC should work with the Mayor's Office of Housing (MOH) to develop and implement additional initiatives to further integrate efficiency into existing and new affordable housing.[80]
EE-11	SFE and SFPUC should consider establishing a low-income efficiency steering committee with the expressed purpose of developing innovative and effective methods for increasing efficiency investment in low-income housing.

ENERGY EFFICIENCY - MULTIPLE EFFICIENCY SERVICES PROVIDERS

Currently, a number of organizations in the city all provide efficiency incentives and services including the SFPUC (municipal customers), PG&E and SFE (retail customers), environmental non-profit groups, as well as private-sector contractors and consultants. Furthermore, efficiency programs for other resources, such as water and natural gas, vie for the attention and limited funds of the same set of consumers. Separate site visits and audits may be conducted for water, natural gas, and electric efficiency programs.

NUMBER	RECOMMENDATION
EE - 12	The BoS should consider establishing an Efficiency Services Providers steering committee to facilitate a more frequent and consistent exchange of information on best practices, coordination, review and recommend new programs, and establish clear definition of roles. Members of the task force should include PG&E, SFPUC, and SFE, as well as low-income representatives, and efficiency contractors.
EE-13	SFE should consider developing a website to share efficiency efforts in the city and to serve as a comprehensive resource for the public to become involved in efficiency programs in San Francisco.

[80] This would include such programs as:

- Specifying efficiency improvements to existing low- and no-interest loan programs for low-income homeowners for rehabilitating properties;
- Tying energy efficiency mortgages with homeownership assistance services;
- Promoting energy efficiency education as part of homeownership assistance services;
- Training programs on efficiency for contractors through MOH's professional designers and architects,;
- Employing ESCOs and the performance-contracting model to finance and integrate efficiency measures into existing rehabilitation programs for distressed public housing (HOPE SF), as well as new including coordination with PG&E's Pacific Energy Center courses

RENEWABLE ENERGY

Misaligned Incentives for Increasing Municipal Renewable Energy

The current configuration of the Power Enterprise severely limits the ability of the utility to make more significant headway in increasing the amount of renewable generation in its system. These constraints include its regulatory commitments associated with Hetch Hetchy power, contractual agreements with TID and MID, limited customer base, financial position and rates structure, and limited transmission and distribution infrastructure.

NUMBER	RECOMMENDATION
RE-1	The SFPUC Power Enterprise should establish a Rate Reform Plan that proposes a new ratemaking structure and process that satisfies credit rating requirements and supports the agency's energy efficiency and renewable energy goals. Once a credit rating can be obtained, Power Enterprise can bond finance renewable projects and blend these costs into its rate base.
RE-2	SFPUC should actively explore renegotiating the contractual power agreements with TID and MID when they expire in 2015 to ensure that renewable power does not displace San Francisco's municipal load, effectively banking Hetch Hetchy power.

RENEWABLE ENERGY - HIGH CAPITAL COSTS AND FINANCING OBSTACLES

The largest constraint to greater penetration of onsite renewable generation is the large up-front cost of these investments. Despite government incentives to decrease the initial cost for installations, the cost of the technology and installation can still be prohibitive. As a result, many San Francisco building owners find it difficult to make these investments.

Facilitating the financing of renewable energy projects has been a high priority for San Franciscans as evidenced by the passage of Propositions B and H in November 2001. Unfortunately, technical problems with both propositions have precluded the issuance of bonds as intended.[81] The recently announced GreenFinanceSF initiative will provide a viable avenue for San Francisco to leverage private funding, via the bond market, to significantly reduce the upfront cost barrier.

NUMBER	RECOMMENDATION
RE-3	San Francisco should ensure the success of GreenFinanceSF by incorporating lessons learned from other models around the country.
RE-4	PG&E should continue to find creative methods for providing critical funding for distributed renewable energy projects that would otherwise have trouble accessing capital markets.

RENEWBLE ENERGY - NEED FOR ACCESS TO INFORMATION

Knowledge about the quality of the renewable resources within the city and technologies that harness them is the foundation for growing the installed capacity of onsite renewable energy in San Francisco. Recognizing the importance of resource data collection and dissemination as a critical first step to promote solar siting and installation, SFE established the SF Solar Map web portal at www.sf.solarmap.org

NUMBER	RECOMMENDATION
RE-5	Using the SF Solar Map as a platform, SFE should expand the tool to include urban wind using data at a resolution that will support the evaluation of a variety of options, ranging from building-mounted to utility scale.

[81] Proposition B permitted the issuance of up to $100 million in revenue bonds to finance clean energy projects for the City. However, two significant conditions on the issuance of bonds limited the ability to structure a viable financing vehicle: 1) City departments could not pay more for energy produced by solar equipment than the cost of power; 2) Bonds were payable only by revenue produced or costs avoided by the improvements. Proposition H permits the City to issue revenue bonds to finance equipment or facilities for renewable energy and energy conservation without voter approval. Proposition H does not identify a source of revenue to support such revenue bonds—a prerequisite pursuant to the California State Constitution. The Power Enterprise who would otherwise be the issuer of these bonds fails the State Constitution's "special fund" test given its disparate customer base, unreliable revenue stream and rate-setting processes.

RENEWABLE ENERGY - NEED FOR DEMONSTRATION PROJECTS

NUMBER	RECOMMENDATION
RE-6	The Office of Economic and Workforce Development, SFE, and SFPUC should collaborate to establish a formal pipeline that will streamline the process for clean energy vendors who would like to set up demonstration projects.
RE-7	SFE and SFPUC should proactively solicit opportunities to partner with private business, national research and development labs, and other institutions dedicated to the advancement of renewable technologies.
RE-8	SFPUC should construct a plan to establish municipal demonstration sites at locations around the City. Several locations have been identified, including Twin Peaks, Ocean Beach, and the San Francisco Zoo.

RENEWABLE ENERGY - EFFICIENT AND FAIR PERMITTING PROCESSES AND PROACTIVE PLANNING

San Francisco has made a significant effort to streamline the permitting process for onsite renewable energy to reduce costs and permitting time without compromising safety. Still, it remains unknown whether larger or more controversial installations, such as utility-scale turbines, could or should be permitted in and around the City.

NUMBER	RECOMMENDATION
RE-9	The Mayor's Office, SFE, and the San Francisco Planning Department should monitor the permitting process to ensure improved efficiency and consistently applied standards for renewable projects
RE-10	The Mayor's Office should consider leading a stakeholder process to inform a master plan identifying San Francisco's most promising sites for large-scale renewable energy development

RENEWABLE ENERGY - DISTRIBUTION SYSTEM IMPACTS

The existing distribution system was designed, built, and operated for centralized generation. Until recently, the amount of distributed generation on the grid has been so limited as to show no noticeable impacts on the distribution and transmission infrastructure. However, with limited capacity for reverse power flows and without controls and communication at the point of use, aging distribution infrastructure could be increasingly challenged by the growth of in-city renewable generation.

NUMBER	RECOMMENDATION
RE-11	In collaboration with SFPUC, PG&E should evaluate geographically specific load-growth forecasts within San Francisco to anticipate and evaluate the impact of distributed generation on feeder lines, substations and transformers.

RENEWABLE ENERGY - COMPETITION FOR RENEWABLE ENERGY RESOURCES

All utilities will face competition for the most cost-effective renewable resources in California and neighboring states due to California's Renewable Portfolio Standard (RPS), as well as similar programs being carried out by other utilities in California and in other Western states. The increasing demand for renewable resources is putting pressure not only on the ability of manufacturers to provide renewable energy technology (such as solar panels and wind turbines), but also upon the availability of the most desirable physical sites to locate these resources. The most accessible and lowest-cost resources will continue to be locked up at a steady rate.

NUMBER	RECOMMENDATION
RE-13	PG&E and SFPUC should discuss and develop options for procuring outside city renewable resources for San Francisco in light of meeting California's RPS requirements.
RE-13a	Options include a voluntary green power pricing program where customers pay a premium rate on their bill for additional renewable energy.
RE-14	SFPUC should explore partnerships with other municipal utilities to evaluate and develop potential renewable energy sites either in close proximity to the City and/or Northern California

RENEWABLE ENERGY - ACCESS TO TRANSMISSION

Access to transmission and distribution infrastructure to bring power into San Francisco is an important issue for the SFPUC. Transmission is likely to be a challenge to access new renewable resources, particularly large-scale renewable resources like wind, solar thermal, and geothermal. The City also continues to be dependent on PG&E for transmitting Hetch Hetchy generation to municipal loads within the City.

NUMBER	RECOMMENDATION
RE-15	SFPUC should complete an evaluation of the cost of a transmission line to bring in renewable power and Hetch Hetchy power directly to the City. This evaluation should assess the cost benefits of the reduced transmission charges that the City would otherwise have to pay to either PG&E (prior to the expiration of the interconnection agreement (IA) in 2015) or the California ISO (after 2015).
RE-16	SFPUC or SFE should evaluate each renewable project to better understand the value and tradeoffs for a resource to meet San Francisco's electricity needs.

COMBINED HEAT AND POWER (CHP OR COGENERATION)

Large commercial buildings and multi-unit apartment complexes greater than 200 kW in demand that use boilers to meet constant heating needs are excellent candidates for CHP. CHP applications smaller than 200 kW are possible, but technology and implementation costs at this smaller scale often become prohibitive. The economic feasibility of CHP projects is highly site-specific and practical implementation requires a more in-depth study into a building's specific operating profiles.

NUMBER	RECOMMENDATION
CHP-1	BoS should consider amending the City Green Building Ordinance to include a requirement that a CHP feasibility study be conducted for all new large development projects and major renovations.
CHP-2	SFPUC and City's energy service providers should evaluate the feasibility of non-traditional ownership models for CHP.
CHP-3	SFE should consider offering support services for CHP installation such as publishing a list of qualified CHP suppliers and installation contractors, and assisting CHP owners with the permitting process.
CHP-4	SFE should consider developing a program to educate residents regarding the net beneficial impact that CHP has on local and global criteria pollutant emissions.

ELECTRIFIED TRANSPORT

Electrified transport offers a number of potential benefits for San Francisco, including a source of indirect CO_2 emissions reductions.

ELECTRIFIED TRANSPORT - BATTERY & VEHICLE MATURITY

As electric vehicles continue to evolve and mature, achieving cost competitiveness with conventional internal combustion engines without federal and state subsidies requires. Further advances in vehicle lightweighting and design, electric motor engine, and manufacturing efficiencies are needed. Additional research and development is needed to further increase the power and range to enable these vehicles to go farther, and longer with cheaper, smaller, lighter, longer-life batteries.

NUMBER	RECOMMENDATION
ET-1	BoS and Mayor should consider providing incentives for companies engaged in battery and electric vehicle research that are located in San Francisco.

ELECTRIFIED TRANSPORT - LACK OF CHARGING INFRASTRUCTURE AND INTERACTION WITH ELECTRIC GRID

Continuing advances in charging technology is important for PHEVs and necessary for EVs. EVs require dedicated electric vehicle supply equipment (EVSEs) instead of simple cords to ensure safe charging. While home charging for PHEVs will be sufficient, EVs run solely on an electric motor without a gasoline engine backup and thus require not only home charging but also public charging stations for extended driving. Although PHEVs can use both EVSE and standard household outlets for charging, most PHEV owners in San Francisco will not have garage access for home charging. Specifying a mode for overnight charging and providing charging infrastructure for customers who rely on street parking will allow a large segment of the city population to use PHEVs.

Although the basic electric infrastructure is already in place to meet PHEV and EV needs, utilities and electric providers will need to upgrade selected local distribution systems, upgrade their information technology, and seek innovative regulatory treatment or develop new business models so that they can serve this new business. While this is not a concern in the near term with low market penetration, over the medium and long term it may require utilities to upgrade neighborhood transformers.

NUMBER	RECOMMENDATION
ET-2	The City should continue its efforts to update and streamline the permitting processes to allow for installation of charging equipment. The SFPUC should develop and implement electric vehicle charging deployment guidelines. SFPUC should consider collaborating with PG&E, SFE, and a potential future CCA provider to do this.
ET-3	BoS should consider modifying or amending building codes to require 220-volt outlets installed in public and private garages of new buildings to accommodate PHEV and EV charging infrastructure, or at a minimum require that electrical conduits be installed in order to allow for the installation of 220-volt lines later.
ET-4	PG&E should continue to study the interaction between electric vehicles, smart metering, and the smart grid.

ELECTRIFIED TRANSPORT - CONSUMER ACCEPTANCE

Consumer acceptance drives market "pull" for electrified vehicles. Experts on innovation have found that any new technology must demonstrate a clear advantage over incumbent technologies and provide observable benefits in order for adoption to occur. Although initial consumer reaction to PHEVs and EVs is positive, addressing vehicle and battery cost, adequate and cost-effective charging infrastructure, and the grid upgrades described above are a necessary first step towards achieving parity with ICE vehicles.

NUMBER	RECOMMENDATION
ET-5	Increase adoption of electrified light-duty vehicles in SF's City-owned fleets. San Francisco has approximately 2,000 light-duty vehicles in its fleet. BoS and the Mayor could set a goal of converting a portion or all of its fleet to PHEVs and EVs in ten years.
ET-6	SFPUC and SFE should supply readily available information for consumers to address their issues and concerns about purchasing and owning PHEVs and EVs.
ET-7	SFE and the City should consider promoting and incenting other forms of electrified transport in addition to light-duty vehicles such as Electric scooters, bicycles, and motorcycles that are ideal for San Francisco's urban and hilly environment. The BoS and Mayor should consider providing tax rebates in addition to providing incentives to establish electric scooter businesses in San Francisco.

GHG TRACKING AND ACCOUNTING

ENVIRONMENTALLY BENEFICIAL LOAD GROWTH AND ACCOUNTING OF NET GHG EMISSIONS

The GHG savings from the gasoline fuel displaced more than offset the additional GHG emissions emitted from electricity generation attributable to PHEVs and EVs. Nevertheless, increasing PHEVs and EVs marginally increases the electric load in San Francisco. This issue presents complex challenges. First, California's regulatory structure rightly establishes a disincentive to load growth for investor-owned utilities through the state's decoupling mechanism. Second, increased electricity generation will ultimately result in increased GHG emissions for a utility, and California's AB 32 Global Warming Solutions Act requires utilities to reduce their GHG emissions.

NUMBER	RECOMMENDATION
GHG-1	SFE and SFPUC should consider informing efforts to examine the accounting of GHG emissions from PHEVs and EVs and implications on the electric and vehicle sector at the state level. Plug-in hybrid electric vehicles will result in lower system-wide greenhouse gas emissions in California. However, existing policies and regulations in California that are designed to reduce GHG emissions in the electricity sector and encourage energy efficiency may discourage the electric utility sector from supporting the implementation of PHEVs and EVS. Addressing the lack of incentives for investor-owned-utilities to grow their load requires action at the state level. Possible options include creating a separate rate class for PHEVs and EVs, or allocating transportation-sector emissions reductions due to PHEVs and EVs in part to the electric sector.

APPENDIX 3 - GREEN TECHNICAL ADVISORY COMMITTEE

Field of Expertise	Name	Affiliation[82]
Thermal and Co-Gen	Gordon Judd	NRG Thermal
Utility-Level Solar	Ed Smeloff	SunPower Corporation
Small-Scale Solar	Jeanine Cotter	Luminalt Energy Corporation
Energy Storage	Stacey Reineccius	Powergetics, Inc
Wind	Todd Pelham	Blue Green Pacific
Energy Efficiency	Martha Amran	Ennovationz/Milken Institute
Demand Response	Sam Enoka	Viasym
Public Policy	Loretta Lynch	Former President, CPUC
Renewable Financing	Dan Adler	CA Clean Energy Fund
Power Plant Task Force	Steve Moss	
Power Plant Task Force	Joe Boss	

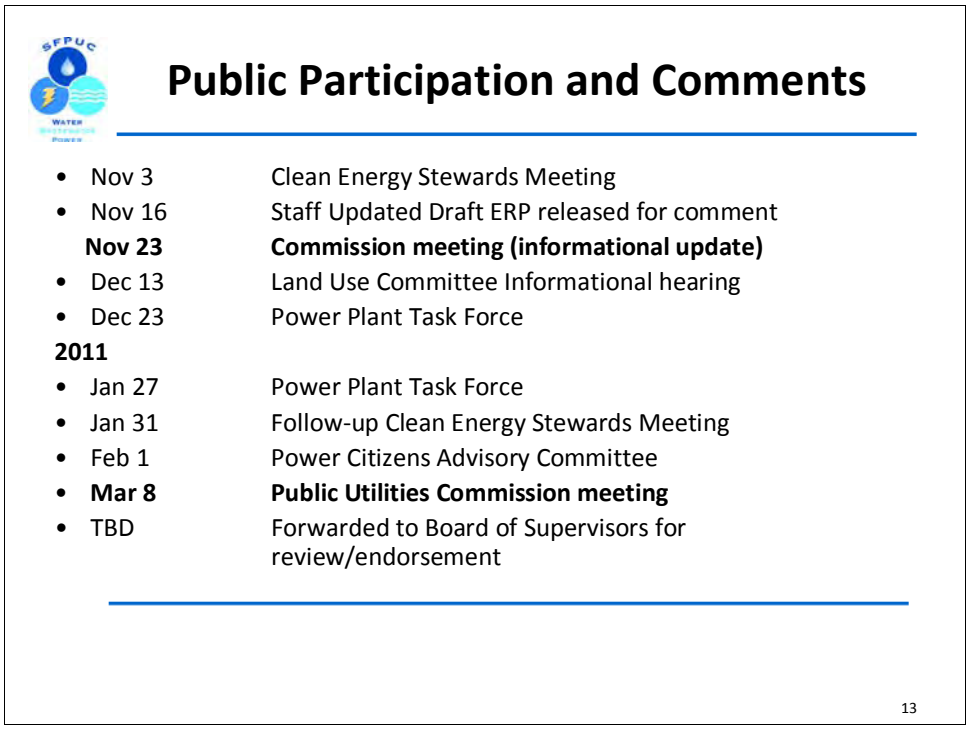
STAFF SUPPORT: Manuel Ramirez (SFPUC)
James Hendry (SFPUC)
Ann Kelly (SFE)

[82] Affiliations are provided for information and identification purposes only and do not represent endorsement by the listed entity for Green TAC recommendations.

APPENDIX 4 - PUBLIC PARTICIPATION AND COMMENTS

Ordinance 94-09 directed that "The process of updating the Electricity Resource Plan should include public outreach to citizens, businesses, and all potentially interested groups including the Power Plant Task Force."

In response to this guidance, the SFPUC presented and discussed the 2011 Updated Electricity Resource Plan in the following forums.



Drafts of the 2011 Updated ERP were also posted to the SFPUC's web-site with the SFPUC providing opportunities to submit comments on the draft.




Join the online conversation at sfwater.org

www.sfwater.org/engage

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