

## San Francisco: Sustainability and the New Energy Horizon in a Model City

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Suggested Citation: Diamond, Michael. 2011. "San Francisco: Sustainability and the New Energy Horizon in a Model City." *Sustainable Cities Policy Project*, [www.davidjhess.org](http://www.davidjhess.org)

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According to a 2011 Siemens/Economist Intelligence Unit study released at the Aspen Institute in Munich, San Francisco is North America's greenest city, beating out such heavy-hitters as Vancouver, New York, Seattle, and Denver. The City by the Bay took one of the top five spots for the categories of energy use, water quality, and air quality; second place for building standards and transportation; and first for waste management (Roggenbuck 2011). What factors can account for San Francisco's position as America's sustainability vanguard?

The city's famously/infamously liberal politics certainly plays a role. It does not take expert deduction to see how it may be easier for the city that brought us Harvey Milk, Gavin Newsom, and Nancy Pelosi to muster the political will needed to pass green legislation. Voters have passed, by wide margins, measures such as the 2001 Proposition H, which set the stage for community choice aggregation (Hess 2005), and the 2003 Proposition K, which continued a sales tax to fund socially and environmentally motivated transportation projects (County of San Francisco 2011).

San Francisco additionally has one of the oldest and most ambitious sustainability plans in the nation. Although there are some notable omissions, mainly in the realm of economics, strong environmental planning has helped San Francisco attain and maintain its position at the top of the list of sustainable cities.

San Francisco's experience with alternative energy, in particular, is illustrative of the benefits and pitfalls of the city's approach to sustainability. The (as of this writing) failed tidal and wave projects shows the tension between ambition and feasibility that plagues some of San Francisco's initiatives. Wind power, both in farms outside and smaller scale models within the city, has been more promising but is not yet well developed. However, San Francisco has been a leader in solar energy and has completed a number of successful solar projects. The city's solar incentive system, specifically GoSolarSF, can serve as a model for other cities wishing to create a more sustainable future. Although its ambitious initiatives occasionally fall victim to financial considerations, San Francisco has a true best practice in its offering of solar credits.

The next portion of this paper will focus on the city's general plans — the 1997 Sustainability Plan and the 2008 Environmental Plan — followed by an analysis of some of San Francisco's major initiatives in waste management and green building standards. Following the general discussion, the second part of the analysis will involve a brief case study of how the tension between ambition and feasibility derailed plans for tidal energy under the Golden Gate Bridge. The third section will be devoted to solar energy and San Francisco's best practice: GoSolarSF.

### Planning as a Key to Success

San Francisco's first sustainability plan and its environmental department, SF Environment, were created in 1996 (City of San Francisco 1996). The report uses the United Nations' definition of sustainability: "A sustainable society meets the needs of the present without sacrificing the ability of future generations and non-human forms of life

to meet their own needs” (Brundtland 1987). At the time, sustainability was somewhat of a novel concept, and the plan spends a considerable amount of space in the introduction explaining its basic ideas. The plan was drafted by experts and included stakeholders from environmental advocacy groups, business, local government, and academia. Furthermore, the draft was subjected to a public comment period. San Francisco adopted the Sustainability Plan as official policy in the summer of 1997.

Organizationally, the plan is divided into two sections, “Specific Environmental Topics” and “Topics that Span Many Issues,” with various subcategories of each. Each subcategory lists its specific drafters and contains long-term goals, goals to be achieved within five years, and specific actions to take to reach those goals. Additionally, the report contains a report card with the criteria “In Progress,” “Accomplished,” or “Not Yet Started” for each proposed action. The report card holds the city accountable for the progress, or lack of progress, being made on each initiative. Another section called “Indicators” provides easy-to-follow indicators that show whether or not San Francisco is meeting its goals and moving in the right direction. These two sections are intended to allow the public to easily keep the government accountable.

In 2008, then-mayor Gavin Newsom released an environmental plan to complement the city’s sustainability plan (Hess et al. 2010). The environmental plan, SForward, contains many of the same elements as the sustainability plan but is more focused and less detailed (City of San Francisco 2008). SForward is divided into eight main sections, each with a major goal and then a list of initiatives the city is taking to reach those goals. The sections are Climate Action, Renewable Energy and Energy Efficiency, Clean Transportation, Urban Forest (meaning green space), Green

Buildings, Zero Waste, Environmental Justice, and Toxics Reduction. After an explanation of each of the goals, there is one unified section on the importance of education.

As a whole, San Francisco's sustainability and environmental plans are meticulously organized and relatively easy for the public to understand. Furthermore, the actions described are generally concrete and possible to monitor for success or failure of the initiatives. The report card greatly facilitated accountability in the older report. Instituting a mechanism for continual updates also improved the plans and ensured that they remain relevant to municipal planning in general. Finally, the drafting of the sustainability plan by experts in the fields covered, and public acknowledgement of the drafters, enhanced the older document's credibility. However, very little attention is paid to costs and limitations. In addition, plans to promote green jobs and businesses are largely absent outside the Environmental Justice section of the Environmental Report. Whereas San Francisco's success in the realms of waste management and green buildings demonstrate the strengths of the city's planning, its experience with tidal power clearly shows those plans' shortcomings in terms of feasibility.

Waste management is one of the best examples of San Francisco's city planning working as intended. The City of San Francisco officially has a Zero Waste policy, with a goal of becoming completely "Zero Waste" by the year 2020. Currently, San Francisco is able to recover 77% of the waste it discards, a significant step forward that exceeds the Environmental Plan's goal of 75% landfill diversion by 2010 (City of San Francisco 2011c). In order to achieve its 2010 goal, San Francisco passed a Universal Recycling Ordinance in 2009 mandating that everyone in San Francisco

properly separate their waste into recyclables, compost, and regular trash (Tam 2011). San Francisco has been ranked as North America's top city for waste management because of this ability to set and achieve ambitious goals (Roggenbuck 2011). Of course, other factors affected San Francisco's ability to reach its waste goals, including its public-private partnership with the employee-owned company Recology and broad-based public support for recycling, reuse, and composting efforts. San Francisco's utilization of its resources from this public-private partnership and public opinion support to dramatically increase landfill diversion is one of the best demonstrations of the city wedding its ambitious goals to practical and feasible solutions (City of San Francisco 2011c).

San Francisco has also made huge progress in planning greener buildings. Priority permitting is given to private buildings that have been certified LEED Gold by the U.S. Green Building Council. In addition, all new municipal buildings and renovations of over 5,000 square feet are required to be certified at least LEED Silver. These are both steps toward the city's eventual goal of having all of its buildings certified as LEED Gold or higher (City of San Francisco 2011b). The city is additionally leading by example with cutting-edge LEED Platinum buildings, such as the California Academy of Sciences (California Academy of Sciences 2011a). The building has some interesting innovations, such as insulation made from 68% recycled blue jeans and its iconic Living Roof, which contains 1.7 million plants of nine native species that were chosen specifically for their ability to thrive in the local conditions of Golden Gate Park's climate (California Academy of Sciences 2011b).

In contrast to San Francisco's successes on most fronts, the city's experiments with tidal power did not live up to their potential. Former Mayor Gavin Newsom was an influential proponent of tidal and wave power, with detailed plans to develop a pioneer wave power project in the Bay. Federal permit applications were submitted and specific companies had been identified as potential suppliers based on which technology was used. Tidal and wave power avoid some of the complications associated with other renewable energy sources, such as the intermittence of solar and wind power (Newsom 2009). However, so far the pilot projects have been financially infeasible. Despite not having a clear, practical path to developing the tidal energy, the city went ahead anyway and ended up with an embarrassing failure. However, Newsom, now the Lieutenant Governor, is still pushing wave power, which is more practical than tidal power, and a project may finally be approved for 2012 or 2013 (Coté 2010). The initial failure of tidal power in San Francisco is a clear indication of the tension between ambition and feasibility in the city's plans. The future success of tidal and wave power, in addition to San Francisco's other more ambitious ventures, will depend on whether the city can learn this lesson about the importance of financial feasibility and practicality.

#### Best Practice: GoSolarSF

In computing, Moore's Law is the observation that the cost of computer chips decreases exponentially with time, halving every 18 months (Halter 2008). Many observers, including Nobel prize-winning economist Paul Krugman, believe that there is a similar "Moore's Law" for photovoltaic (PV) solar cells. Even though this growth is considerably slower — costs are estimated to be decreasing at an annual rate of about

seven percent — the growth is still exponential. At some point, this exponential decrease in costs will make electricity generated by PV cells cheaper than electricity from coal. Krugman believes that the point is set to arrive at some time in the next decade and that if the government did not subsidize the fossil fuel industry so heavily, both directly and indirectly (not internalizing the cost of externalities), that point would likely have already occurred (Krugman 2011). For evidence, the Department of Energy's National Renewable Energy Laboratory has tracked PV prices since 1980, and the graph of its records suggests exponential growth. Moreover, the graph expressed on a logarithmic scale also suggests exponential growth. Thus, at least for the past 30 years up to the present, it is safe to conclude that some form of Moore's Law has existed for solar photovoltaics. Two main factors are driving this growth: cell manufacturers are using less and less material to create their cells and the cells themselves are becoming more efficient, meaning they are able to capture a greater percentage of the sun's energy to which they are exposed (Naam 2011).

Of course, there are limits to how much costs can decrease. So far, it seems that installation costs have decreased at a similar rate to that of the cost of producing the PV cells, although there is no guarantee that this trend will continue. Indeed, there is no guarantee that the exponential growth trend will continue in the future, although it seems a good bet that it will for at least the next decade and the decreases from 2009 and 2010 actually seem to be ahead of the current trend. Regardless, solar energy will, in the future, perhaps the very near future, reach market parity with fossil-fuel energy (*Ibid*). A forward-looking city would do well to prepare for that moment with investments

in solar energy now, in addition to the obvious sustainability benefits from switching to a renewable energy source.

Unsurprisingly, San Francisco has recognized the medium- to long-term economic trends, as well as sustainability considerations, and made significant investments in solar energy accordingly. GoSolarSF, an incentive program for individuals, businesses, and non-profits, may be San Francisco's most successful solar initiative and may serve as a model for other cities.

GoSolarSF works by awarding first-come-first-served incentives to households, businesses, or non-profits that plan to install solar panels (City of San Francisco 2011a). Government entities are not eligible. This is because, in San Francisco, installing solar power for municipal use is not a cost-effective way to reduce greenhouse-gas emissions given that municipal energy is already generated from carbon-neutral hydroelectricity at the Hetch Hetchy Reservoir. Personal and commercial use of solar energy, however, is an effective means of reducing emissions, because Pacific Gas & Electric's (PG&E) electricity, which is used by a majority of the rest of the city, is generated mostly from fossil fuels. Thus, GoSolarSF focuses on the energy use that most effectively achieves San Francisco's sustainability and climate goals rather than subsidizing projects regardless of merit (SPUR 2011).

All individuals are eligible for the \$2,000<sup>†</sup> basic incentive and an additional \$750 city installer incentive for using a locally-owned installation business, as defined by the San Francisco Human Rights Commission. Certified installers with more than three full-time employees must participate in the TrainGreenSF program or another program that

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<sup>†</sup> All dollar amounts in this section are based on the 2011-2012 GoSolarSF application and are likely to change in future manifestations of the program.

hires and trains local youth for green jobs. In addition, individuals living in the historically disadvantaged 94107 and 94124 zip codes are eligible for a \$3,000 environmental justice incentive instead of the basic incentive, and low-income individuals are eligible for an additional \$7,000 low-income incentive. Under no circumstances may incentives (including federal and state incentives) total more than the cost of installing the panels. These extra incentives effectively fuse San Francisco's dual goals of environmental sustainability and social responsibility (City of San Francisco 2011a).

Businesses and non-profits have a more straightforward incentive system, although their incentives are measured per kW (\$1,500/kW) up to some limit (\$10,000 for businesses, \$120,000 for non-profits), rather than lump-sum like the individual incentives. Multi-unit, residential non-profit organizations or for-profit organizations that offer more than 75% of their units as affordable housing are eligible for higher incentives per kW (\$3,500), although their cap (\$60,000) is lower than regular non-profits (*Ibid*).

There are two main steps to claiming incentives under GoSolarSF: reserving the incentive and receiving the incentive. To reserve an incentive, one must fill out or provide a number of forms regarding the solar project and low-income or environmental justice status, if applicable. Many of the forms can simply be copies of those used for other federal or state incentives to reduce redundancy. Within 30 days of receiving a reservation letter with all the necessary forms, the San Francisco Public Utility Commission (SFPUC), which administers GoSolarSF, will accept or reject the application. After acceptance, the applicant has nine months to complete the project. The promised funds are reserved for those nine months and can be released once the solar project is complete. To certify that a project is complete, SFPUC needs a few

more forms and assurance from PG&E that the solar panels are connected to the grid. In addition, an IRS form must be filled because incentives can count as income for tax purposes. One application is accepted per meter, meaning that a PV system can receive multiple GoSolarSF incentives if it is connected to multiple different meters. There is a handy checklist at the end of the application, which simplifies the process of checking the application for completeness, as is explicitly recommended by the SFPUC (*Ibid*).

GoSolarSF has had a number of appreciable effects on San Francisco. In 2007, GoSolarSF convinced Suntech to locate its North American headquarters in San Francisco, and since then numerous other solar companies, including the locally-owned firm Luminalt, the Canadian firm Tioga, and even firms from China and Germany, have chosen to headquarter in San Francisco as well (Cotter & Shaw 2011, Ting & Hocschild 2011). The Mayor's Office of Economic Development has estimated that over 450 solar jobs have been created as a result of GoSolarSF. Assessor-recorder and 2011 mayoral candidate Phil Ting, who served on the San Francisco Solar Task Force that created GoSolarSF, further claims that the incentive program quadrupled the number of solar roofs in San Francisco and raised the values of the homes on which they were installed, increasing city revenue by \$2,000 for each house sold because of higher property taxes on the now-more-valuable homes (Ting 2011).

Despite GoSolarSF's success, there have been partially successful attempts to scale the program back. Ed Harrington, the General Manager of the SFPUC, cut GoSolarSF by 40% due to budgetary constraints. His rationale was that other programs would be too costly to cut, energy efficiency reduces emissions more efficiently, and

demand for the program was waning, as evidenced by a leftover \$1.4 million from the 2010-2011 budget. Furthermore, he stated that the \$15 million spent over three years only created 23 low-income jobs (Harrington 2011). Ting disagrees with the characterization of the extra \$1.4 million as evidence of a decrease in demand for the program; instead, he explains the surplus as the result of a large solar project falling through at the last minute (Ting 2011). Ting also claims that Harrington's "facts are off" when it comes to employment. Indeed, it would seem incompatible with any economic model, even non-Keynesian models, that \$15 million in spending would create only 23 jobs. Ting suggests that Harrington must have been basing his calculations on only the most narrow of criteria to reach that number. The idea that only 23 low-income workers would still be employed in installation is valid enough: with only a nine month window to complete a project, installation jobs cannot be expected to last for long (Ting & Hocschild 2011). However, measuring GoSolarSF's economic impacts on this number alone discounts all of the other jobs created directly in the solar firms that increased production to keep up with demand or moved their headquarters to San Francisco and indirectly through energy savings to businesses and extra spending money for workers, families with lower electricity bills, etc.

The \$1.4 million left over from 2010-2011 has been rolled over to the 2011-2012 budget, increasing it from \$3 million to \$4.4 million (it was \$5 million in years prior). Still, the incentives for an average family, which before were widely reported as about \$6,000 on average, have decreased to a basic incentive of \$2,000 plus the \$750 City Installer Incentive. Although this is still a significant incentive, restoring funding would certainly hasten the arrival of solar's market parity with fossil fuels in the San Francisco markets,

which is a reasonable goal for a city that has spent considerable resources portraying itself as a solar vanguard (City of San Francisco 2011a).

Another interesting semi-controversy about GoSolarSF involves the Hetch Hetchy Reservoir. GoSolarSF is funded by the sale of excess hydroelectric power created at the dam site. There have been movements, however, to close Hetch Hetchy and return the Yosemite valley to its natural state. There was a lot of controversy over the flooding of Hetch Hetchy valley when the dam was first created in the 1920's, but the area has been a reservoir for all the time since. Still, some activists with the nonprofit group Restore Hetch Hetchy want to drain the reservoir and restore the valley to its "natural" state. The unintended consequence of this action, besides concerns with potable water supplies and hydroelectric energy, would be to damage renewable energy initiatives, as GoSolarSF and other programs, like retrofits, are funded from Hetch Hetchy's activity (Bowe 2011).

Besides GoSolarSF, San Francisco has a number of other notable solar initiatives. There are numerous smaller projects, some of which were funded by the American Recovery and Reinvestment Act of 2009 (San Francisco Solar Map 2011). In addition, there is a large municipal solar project at Sunset Reservoir that cost about \$40 million and provides 5 MW of power. In comparison, GoSolarSF provided 5 MW for only \$10 million (Ting 2011). Although both initiatives have benefited San Francisco, this comparison further shows how GoSolarSF's targeted approach reaps great dividends.

Summary and Recommendations

San Francisco's sustainability and environmental plans are meticulously organized and relatively easy for the public to understand, with concrete actions that can be easily monitored. Although the 1996 Sustainability Plan differed in some important manners from the 2008 Environmental Plan, overall planning for the city remains strong and organized. San Francisco is already slightly ahead of plan on some initiatives, like Zero Waste, or right on track, as it is for building standards. However, the lack of a general, comprehensive green jobs and business plan outside of the environmental justice plan impedes effective policy-making. Additionally, San Francisco still needs to work out improved funding mechanisms or other alternative avenues for some of its more ambitious programs that are not feasible under standard conditions, such as tidal power. Taken as a whole, however, San Francisco's planning is rivaled by that of few other North American cities.

GoSolarSF is an innovative solar credit program that can serve as a model for other cities wishing to emulate San Francisco's sustainable success. The credit is relatively generous and will be an even more powerful incentive as the cost of PV solar decreases according to Moore's law and reaches price parity with that of fossil fuels. San Francisco also contributed to its environmental justice goals by restructuring the program to take the concerns of lower-income individuals into account. Although affected by budget cuts, GoSolarSF still continues to incentivize solar installations. If full funding is restored in the near future, the incentive program will be better able to serve as a cost-effective way to meet San Francisco's sustainability goals and boost the economy at the same time. Initiatives such as GoSolarSF make San Francisco a global leader in solar initiatives, and other cities would do well to take notes on its successes.

Although San Francisco is well ahead of its potential competition, there is still room for improvement. The official plans themselves can be amended based on the success of past plans and plans in other cities. The report card greatly facilitated accountability in the older report but was absent in the Environmental Plan; a similar report card to the Sustainability Plan should be included in the next addition of either plan — the Sustainability Indicators and Implementation sections of New York City's PlaNYC can serve as a model. Additionally, a separate section addressing economic and financial considerations and green jobs within the plan would be helpful. Moreover, the city must take feasibility into greater consideration, perhaps by collaborating more closely with independent analysts and/or the private sector, in order to turn its ambitions into realities.

Portability could possibly be a problem with using San Francisco as a model for other cities to follow. Although cities tend to lean liberal, very few are as deep blue as San Francisco. Unfortunately, sustainability has been caught up in the polarized duopoly of America's political system, and greening efforts have become perceived as a "liberal," "progressive," or "leftist" concern. Regardless of the accuracy or inaccuracy of such a classification, unless sustainability is somehow extricated from the left-right paradigm, political resistance to sustainable initiatives is likely to factor much more heavily in most other cities than in San Francisco. This increased resistance could make some initiatives that were feasible in San Francisco, such as community choice aggregation, infeasible elsewhere. In addition, geology and geography affect the ability of certain cities to promote alternative energy. Cities in structural basins, such as Nashville, or in otherwise non-windy areas may not be able to replicate San Francisco's

wind projects, and those not on the coasts cannot hope to take advantage of tidal power (although other forms of hydroelectric power may be available). Furthermore, cities such as Seattle that do not receive sufficient sunlight may not be able to replicate San Francisco's solar initiatives.

San Francisco has attained an unusual level of success in achieving its sustainability goals for an American city as a result of both factors unique to San Francisco and also factors that can be adopted elsewhere. In some areas, San Francisco can still stand to learn from other cities' experiences and its own past experience. Overall, however, San Francisco's portable initiatives, especially solar incentive programs like GoSolarSF, can serve as models for the rest of North America, and, indeed, the world.

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