

# SAN FRANCISCO PEAK OIL PREPAREDNESS TASK FORCE REPORT; 2009

## 2. INTRODUCTION

The San Francisco Peak Oil Preparedness Task Force was created by the Board of Supervisors on October 5, 2008. Its charge is to assess the impact of declining supplies and rising prices of fossil fuels, create a plan to mitigate the ill effects, and recommend actions to the Board.<sup>1</sup> The Task Force consists of seven members, whose backgrounds are detailed in Appendix I. For the purposes of this report, the term “Peak Oil and Gas” encompasses all petroleum liquids, natural gas liquids, and dry natural gas.

**2.1 Petroleum:** Oil is a finite resource. It is the linchpin of all modern economies. In addition to serving as the fuel for 95% of all transportation, tractors, and other heavy equipment, it is used as a feedstock for plastics, chemicals, fabrics, cosmetics, and pesticides. Like most commodities, its price is determined by the market forces of supply and demand. Demand for oil has been rising sharply, as developing economies of China and India grow.

The future of oil is a classic case of too much demand chasing too little supply. Prior to its recent fall, the price of oil had been trending upward for more than five years. When the economy begins to right itself, it is virtually certain that oil’s price will resume its upward march. Another historical feature of the price of oil is its extreme variability. The Task Force expects the price of oil to oscillate around an upward trend.

*“Current trends in energy supply and consumption are patently unsustainable – environmentally, economically, and socially – and they can and must be altered. One thing is certain. While market imbalances will feed volatility, the era of cheap oil is over.”*

*-- Nobuo Tanaka, Executive Director,  
International Energy Agency of the Organization for Economic Co-Operation and Development,  
from World Energy Outlook 2008*

There are still vast reserves of oil in the ground. What matters to the world’s economy, however, is not the oil in the ground, but rather how much can be extracted in a given time – that is, oil production. This is conventionally measured in millions of barrels per day. Today, worldwide production of petroleum liquids is about 86 million barrels per day.<sup>3</sup> The production of oil is limited by both geological obstacles that constrain the speed with which it can be pumped from the ground, and by human constraints, such as political decisions and wars.

Although we are not running out of oil, many analysts believe that the world is at or near the physical limit to how fast oil can be produced. Any given oil field produces oil at a flow rate that roughly follows a bell-shaped curve over time. When you add up all those bell curves, total worldwide production forms a big global bell curve.

Though not all production curves are exactly bell-shaped, certain key features are present in the production curve for an oil reservoir: Production increases over time, reaches a peak when approximately half the available oil has been pumped, and begins a steady and

inexorable decline thereafter. The first half of the available production is the oil that is the easiest and cheapest to extract. As oil in a particular field is depleted, it costs more, in money and in energy expended, to bring the oil to market. Eventually, it takes more energy to extract the oil than the oil embodies, and then the field is abandoned.

Oil production in the United States peaked in 1970; the North Sea in 1999<sup>4</sup>, and in Australia in 2000. (See list of countries and dates of peak in Appendix II.)<sup>5</sup> Worldwide, oil production has been flat since 2005.<sup>6</sup> Unconventional sources of oil have kept the total production of petroleum liquids at a plateau as conventional production has wavered. Global oil discoveries have been declining since 1964, with consumption exceeding discoveries since 1982.<sup>7</sup>

But total production is not the most relevant statistic for San Francisco and the United States. For major importers, the salient issue is the amount of oil available to purchase on world markets. As time passes, oil producing nations gradually use more oil domestically, thus leaving less for export, even if their production is unchanged. They may also withhold production, believing that prices will be higher later on, or to ensure their own future supply of oil. Thus, even without a production decline, oil exports may fall.

Moreover, the US is now bidding against China and other importing nations for a shrinking pool of oil available for export. Worldwide, net oil exports reached a maximum in late 2005, and have been trending downward since then. Exports are currently 3% below their peak.<sup>8</sup>

And this is only the beginning. Production from existing post-peak oil fields is falling 6-9% per year, according to the International Energy Agency of the OECD.<sup>9</sup> That means that *each year* the world will need to add new fields with annual production of at least 5 million barrels per day just to offset the decline of existing fields. To put this in context, the Athabaskan tar sands in Canada are currently producing 1 million barrels per day and hoping to reach 3 million per day within a decade.<sup>10</sup>

Getting back to price: As the peak of production approaches, the world is not running out of oil, but it *is* running out of oil that is easy to get at and therefore affordable. Regardless of the quantity of oil existing beneath the surface of the Middle East, in deep water, or in tar sands, it will be increasingly expensive to pump and process, resulting in a continuing trend of rising prices.

Wild gyrations in price will almost certainly continue, but the trend will be upward. Until recently, energy has been extraordinarily cheap, cheap enough that we have been able to use it wastefully. That is changing before our eyes, and we need to change our attitude to match the new reality. In the summer of 2008, the world got a taste of how fast and how far oil prices can skyrocket, and the resulting economic and social pain. Try it: imagine gasoline at \$10 a gallon.

**2.2 Natural Gas:** Historically, the United States has supplied its own natural gas, or purchased it from Canada. However, natural gas production in North America is also close to peak. Conventional production of natural gas is already in decline and has been since 2003.<sup>11</sup> Total North American natural gas production has been buoyed up by a surge in unconventional natural gas production (shale gas). Shale gas is gas trapped in non-porous rock. Releasing it requires drilling many more wells per unit of output (which is why it was not harvested before), and therefore, it is significantly more expensive to produce than conventional gas. As unconventional natural gas makes up an ever larger percentage of total production, the average cost of natural gas will climb.

Another source of natural gas is LNG -- liquified natural gas. LNG is actually the same as the natural gas once in abundance in North America. It is different only because it is imported from overseas -- but at great expense of money and energy in that it must be liquified and shipped on specialized vessels and then reprocessed at LNG plants here. The strategy of making up the difference between the stagnant North American gas production with LNG has been unsuccessful thus far because the world price of LNG is higher than the North American price. Over the past twenty years, natural gas prices have been 86% correlated with oil prices.<sup>12</sup> Natural gas is frequently sold under long term contracts in which the price is based on the price of oil. In many applications, such as heating (outside of the northeastern United States) and industrial processes, it has replaced oil. Given all these factors, natural gas will increase in price and decline in availability, just as oil will.

**2.3 Electricity:** Electricity prices will follow the price of natural gas, especially in California. In 2008, approximately 44% of electricity sold by Pacific Gas and Electric (PG&E) was generated from natural gas.<sup>13</sup> In March, 2008, PG&E asked for a 6.8% increase in electric rates, specifically citing the rise in natural gas costs.<sup>14</sup>

Looking ahead, many Americans expect the United States to substitute energy from fossil fuels with electricity generated by renewable sources. However, the magnitude of the fossil fuel energy which must be replaced will make this goal virtually unattainable. Electricity peak reduction strategies and energy efficiency measures can help, but transportation will be a large hurdle to surmount. A study by the Pacific Northwest Energy Center estimates that only 15% of California's light vehicle fleet can be run off today's electric grid.<sup>15</sup> Another example: imagine that San Francisco's vehicle fleet were magically transformed to all-electric plug-in vehicles. The electricity to power vehicles for current driving *within the city limits alone* would exceed all electricity now used in San Francisco for all purposes.<sup>16</sup>

Meanwhile, despite our best efforts, the electricity generated from wind, solar, geothermal, and small hydroelectric combined adds up to only 1% of energy used in San Francisco. See Chapter 3 on energy for more details on energy use in San Francisco.

**2.4 Climate Change:** There is a great confluence of interest between mitigation strategies for Peak Oil and Gas and for Climate Change. The core concept for addressing both issues is the need to reduce and eventually eliminate the use of fossil fuels.

*“Climate change makes moving off of oil necessary; peak oil makes it inevitable.”*

*-- Richard Heinberg<sup>17</sup>*

**2.5 Relation to Other Issues:** We are embarking upon a new epoch in world history. Tightening supplies of oil and natural gas are part of a larger matrix of ecological overshoot that will pose a growing challenge. Western industrial civilization is built on energy, not just energy, but *cheap* energy - and cheap commodities in general. That era is coming to an end. Our society is in a race against time, the time is required to make the transition to a lower energy society. In the medium term, there are likely to be serious economic and social dislocations, and there is the possibility of eventual catastrophe.

**2.6 Economic Impact:** The leading edge of peak oil will be its economic impact. When the Federal Reserve Bank of Philadelphia did a comprehensive study of the effect of oil price changes on the economy, it found a profoundly negative relationship. According to its report, the 2008 doubling of oil prices will reduce 2009 US economic output by 11% from what it otherwise would have been. It doesn't even matter that the price spike was temporary; the damage to the economy was long-lasting.<sup>18</sup> We may not even recognize the connection, but oil constraints will hobble economic growth. For more, see Chapter 4 on the economy.

**2.7 Transportation:** When we think of oil, we tend to think of gasoline and cars. Though vehicle fuel will take a big hit, cars won't be the only victims. Freight shipment and large equipment used in construction and agriculture are equally vital to the economy and more difficult to replace or conserve away. Cheap air travel will be another casualty of peak oil, with a huge impact on San Francisco's vital tourism sector. For more, see Chapter 6 on Transportation.

**2.8 Food:** Food production will be impacted both through rising costs of oil- and gas-based fertilizers and pesticides, and the increasing fuel costs of equipment and transporting to market. Though the Bay Area is rich in food resources, supplying food to San Franciscans of all economic strata will be a growing issue. For more, see Chapter 5, Food Security.

**2.9 City Services and Infrastructure:** San Francisco is relatively well situated in terms of providing basic city services, because of the electric power flowing from the O'Shaughnessy Dam at Hetch Hetchy. The biggest stressor on the City and County of San Francisco (the City) will be the economic impact on City revenues. Between the struggling economy, rising food prices, increasing cost of transportation, and growing number of people needing assistance, the strain on the City budget will climb, just at the moment when City revenues will be adversely affected by the bad economy. For more, see Chapters 7 through 9 on water, wastewater, and waste disposal, Chapter 4 on the economy (for a discussion of City revenues), and Chapter 12 on protection of vulnerable populations.

**2.10 Emergency Services:** The supply chains for oil and gas are long and complex. As demand outstrips supply, the possibility of disruptions in energy delivery becomes ever greater. In the 1970s, we saw the havoc that can be wrought by even brief interruptions. And, more recently, the American south experienced shortages and long queues after some refineries were temporarily closed by Hurricane Ike. Planning for emergency situations should take the possibility of energy shortages into account, both as emergency events in their own right, and as complications in coping with other emergency situations. For more, see Chapter 10, Emergency Services.

**2.11 Strategies:** There is no road map for the bumpy future. Though oil and natural gas availability will decline, that doesn't necessarily mean we will go back in time to old-fashioned ways of living. The challenge is to find a new way forward. Whatever shape the low-carbon future will take, there are certain basic strategic concepts that will underlie the recommendations in this report.

ÿ **START NOW.** Many of the transitions will take a long time, such as developing the transit system to be ready to handle an influx of riders. If we wait, the most vulnerable people will be hurt.

ÿ **BE FLEXIBLE.** Peak Oil is an unprecedented situation, especially in combination with economic recession, climate change, and general environmental overshoot. This Task Force has attempted to make broad-based recommendations, but given the complexity of the situation, the City will need to be prepared to adjust its response to changing circumstances.

ÿ **FOCUS ON CONSERVATION.** The scale of the energy that needs to be replaced is so huge that only large-scale conservation projects combined with a variety of alternative energy generation can prevent wrenching dislocations.

ÿ **FOCUS ON ELECTRICITY.** Due to price volatility, price signals are likely to come too late to stimulate an adequate supply of alternatives for transportation, heating, cooking, and so on through the operation of the market. Government needs to intervene to ensure that when San Franciscans want to move away from fossil fuels, alternatives exist in sufficient quantity. The City will need to take control of its own energy supply in order to push ahead fast enough. In moving away from fossil fuels, the primary alternatives all produce energy in the form of electricity; therefore, a successful transition will require electrification of transit and other current fossil fuel users.

See Chapter 14, Vision of Low-Carbon San Francisco, for a positive post-peak vision of San Francisco, circa 2050.

**2.12 Damage to social fabric:** The Task Force acknowledges the possibility of a scenario in which the fabric of society is so severely damaged that it results in unemployment, hunger, and crime. While such a collapse is not out of the realm of possibility, the Task Force felt it would not be constructive to focus on it. Should such a

situation occur, it will be too late for the City to respond in a meaningful way. The strategies the Task Force chose to consider are meant to reduce the likelihood of such an outcome.

**2.13 Goal of the Peak Oil Preparedness Task Force:** The evolving energy limitations will pose a tremendous challenge to San Francisco, and San Francisco will not be able to solve the problem of peak oil on its own, though it can respond. Adaptation strategies must be pursued at every level: municipal, regional, state, federal and international. Finding policies to meet this challenge will be difficult, but will pay off. The Peak Oil Preparedness Task Force was created to identify these policies.<sup>1</sup>

This is also an opportunity for San Francisco to take the lead in building on more than a decade of progress toward a low-carbon future. San Francisco is uniquely suited to move ahead because of its aware and active residents, and its progressive tradition in government – and aggressive action here can point the way for California and the United States.

Moreover, with a challenge like Peak Oil and Gas, requiring long-term thinking and a major socio-economic paradigm shift, strictly market-based coping cannot be counted upon to arrive at the best course of action. The city must step forward to set priorities and plan how to move toward the best resolution for all its citizens. It is the mission of the Task Force to assist the City in making such a plan.

## **ENDNOTES**

<sup>1</sup> Resolution 268-07, establishing the Peak Oil Preparedness Task Force; <http://www.sfgov.org/site/uploadedfiles/bdsupvrs/resolutions07/r0268-07.pdf>

<sup>2</sup> “New Energy Realities - WEO Calls for Global Energy Revolution Despite Economic Crisis,” *World Energy Outlook*; November 12, 2008; International Energy Agency, [http://www.iea.org/textbase/press/pressdetail.asp?PRESS\\_REL\\_ID=275](http://www.iea.org/textbase/press/pressdetail.asp?PRESS_REL_ID=275).

<sup>3</sup> *International Petroleum Monthly*, Energy Information Agency (EIA), US Department of Energy; <http://www.eia.doe.gov/ipm/supply.html>.

<sup>4</sup> Discussion of US and North Sea peak [http://www.energybulletin.net/node/1700\\_9](http://www.energybulletin.net/node/1700_9)

<sup>5</sup> Energy Watch Group, *Crude Oil: The Supply Outlook*, updated February 2008; [http://www.energywatchgroup.org/fileadmin/global/pdf/2008-02\\_EWG\\_Oil\\_Report\\_updated.pdf](http://www.energywatchgroup.org/fileadmin/global/pdf/2008-02_EWG_Oil_Report_updated.pdf).

<sup>6</sup> International Energy Agency, OECD, *World Energy Outlook*, 2008

<sup>7</sup> San Francisco Informatics, *The Oil Age Poster*, <http://www.oilposter.org>.

<sup>8</sup> *Net Oil Exports Blog*, information compiled from the Energy Information Agency and British Petroleum data; <http://netoilexports.blogspot.com/>.

<sup>9</sup> International Energy Agency “Fact Sheet” for 2008, *World Energy Outlook, 2008*, [http://www.worldenergyoutlook.org/docs/weo2008/fact\\_sheets\\_08.pdf](http://www.worldenergyoutlook.org/docs/weo2008/fact_sheets_08.pdf).

<sup>10</sup> *The Oil Sands Of Alberta; Where Black Gold And Riches Can Be Found In The Sand*, 60 Minutes, June 25, 2006; [http://www.cbsnews.com/stories/2006/01/20/60minutes/main1225184\\_page2.shtml](http://www.cbsnews.com/stories/2006/01/20/60minutes/main1225184_page2.shtml)

<sup>11</sup> *International Natural Gas Production*, Energy Information Agency, <http://www.eia.doe.gov/emeu/international/gasproduction.html>.

<sup>12</sup> IEA, *Monthly Energy Review*, quoted in Awerbuch, Shimon, and Souter, Raphael, *Exploiting the Oil-GDP Effect to Support Renewables Deployment*, October, 2004

<sup>13</sup> Pacific Gas and Electric insert with energy bills, November 2008.

<sup>14</sup> Pacific Gas and Electric, March 2008; <http://www.pge.com/mybusiness/myaccount/explanationofbill/billinserts/previous/index.shtml>.

<sup>15</sup> Kintner-Meyer, Michael; Pratt, Robert; and Schneider, Kevin; *Impacts Assessment of Plug-in Hybrid Vehicles on Electric Utilities and Regional U.S. Power Grids*, Pacific Northwest National Laboratory, November 2007; [http://209.85.173.132/search?q=cache:0ugLQnvxG10J:www.pnl.gov/energy/eed/etd/pdfs/phev\\_feasibility\\_analysis\\_combined.pdf+PHEV+feasibility+analysis+site:pnl.gov&hl=en&ct=clnk&cd=1&gl=us#12](http://209.85.173.132/search?q=cache:0ugLQnvxG10J:www.pnl.gov/energy/eed/etd/pdfs/phev_feasibility_analysis_combined.pdf+PHEV+feasibility+analysis+site:pnl.gov&hl=en&ct=clnk&cd=1&gl=us#12)

<sup>16</sup> Figures furnished by San Francisco Department of the Environment

<sup>17</sup> Heinberg, Richard; author of *The Party's Over*

<sup>18</sup> Sill, Keith; Senior Economist, Federal Reserve Bank of Philadelphia; *The Macroeconomics of Oil Shocks*, Business Review; First Quarter 2007

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**3. ENERGY**  
**(Numbering will be reformatted prior to publication.)**

**3.0 Introduction**

At its core the issue of Peak Oil is about energy, and in that sense, this entire report is about energy, so it raises the question, why have a distinct energy section and what should be in it? The Resolution Establishing the Peak Oil Preparedness Task Force specifically directed the Task Force to assess “current modes of electricity generation and

transmission, and the feasibility of distributed generation alternatives.”<sup>1</sup> This section embodies a response to that directive. Further, limitations in petroleum fuels will likely have impacts across the entire energy sector; therefore, the Task Force has endeavored to take a holistic approach to the problem of Peak Oil.

Electricity generation, transmission, distribution, and end use is an enormous issue. This section does not attempt to address every aspect of the energy sector. Rather, it will focus on the impacts that Peak Oil and peak natural gas will have on San Francisco and the practical, constructive measures the City and County government (City) may choose to implement in response.

Early in its deliberations, the Task Force recognized that in order to adequately address issues such as electricity generation, the other two primary fossil fuels involved in electricity generation, natural gas and coal, would need to be included in the analysis. Natural gas is also used widely in space and water heating and cooking in San Francisco. Therefore, this section does assess the degree to which the city depends on natural gas for those purposes, for electricity generation, and for other energy-related purposes, and the risks associated with that dependency. In this section the term “Peak Oil & Gas” is used to express this broader assessment. Since a small amount of coal is used for electricity generation, coal is included briefly in the analysis as well.

In recent years, San Francisco and many other cities have adopted programs aimed at reducing greenhouse gas emissions. Responses to concerns about the peaking of fossil fuel supplies must not counteract these programs. Fortunately there is a confluence of interest in this matter in that the primary response that most effectively addresses both problems is the same: reduce and eventually eliminate fossil fuel use. However, this seemingly common sense response is not necessarily the case among energy analysts. There do exist strong proponents of a coal-based approach to mitigating declines in petroleum and natural gas supply. It is the position of the Task Force that the City should avoid strategies that conflict with other environmental goals; therefore, the Task Force does not view an increase in coal use as an appropriate response to decreases in other fossil fuels.

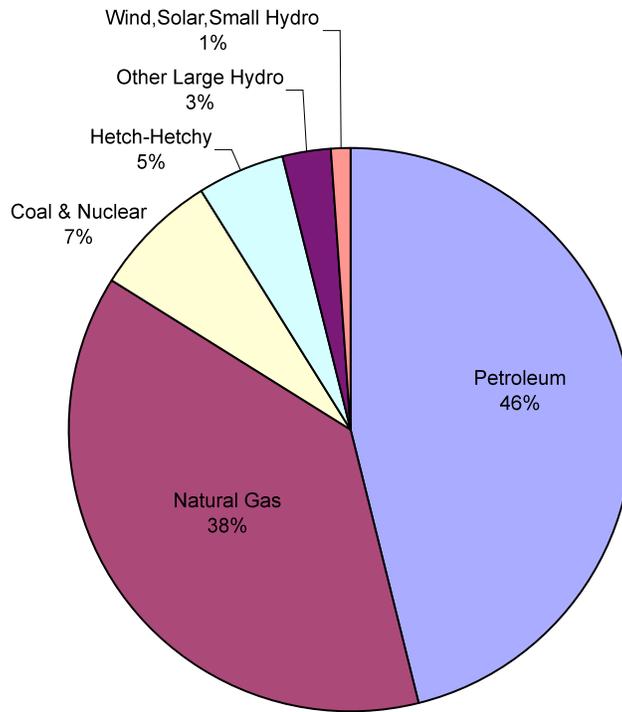
Two final notes: One is that this section does not cover transportation or vehicle fuels in detail. See Chapter 6 on Transportation for information on that sector. The other is that the list of emerging renewable energy technologies presented in the “Supply Side” measures in section 5.3., Strategies and Goals, should not be construed as “solutions” to the problems imposed by Peak Oil & Gas.

### **5.1 Assessment of Current Situation:**

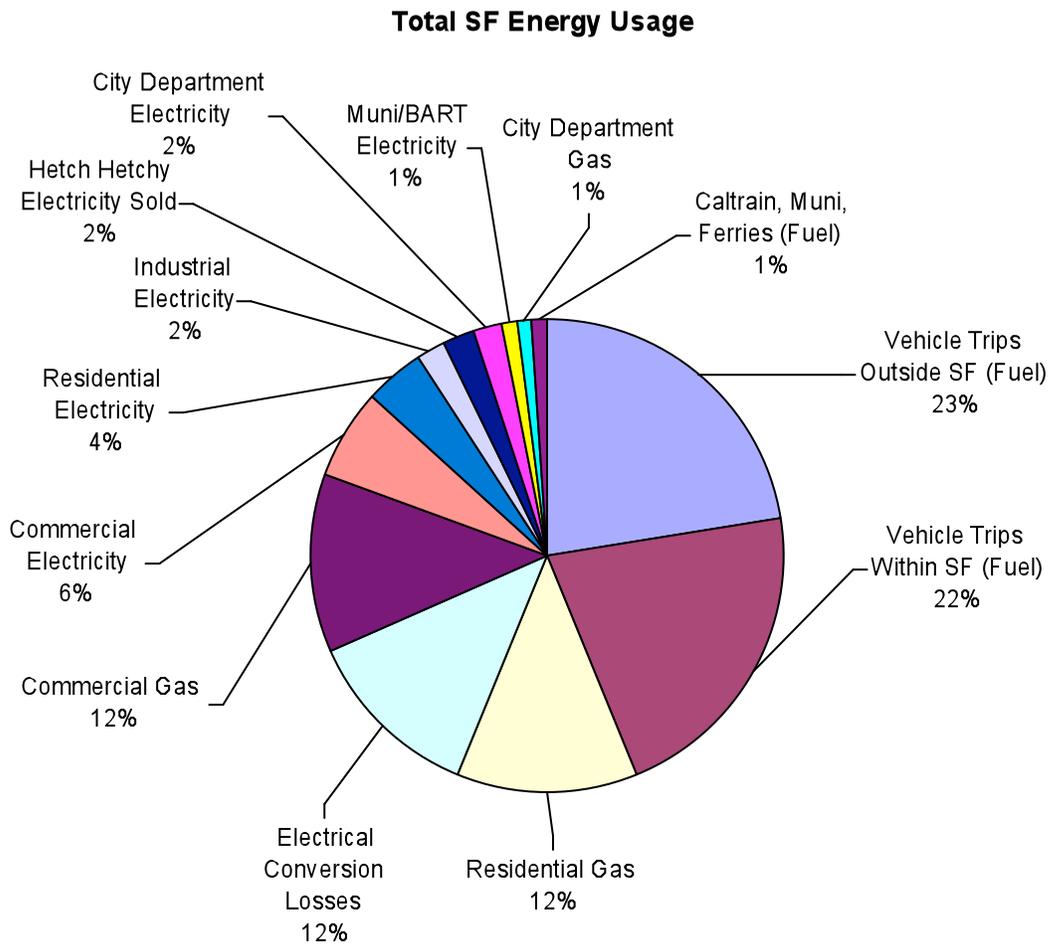
The picture of current energy use San Francisco is painted in broad swaths with fossil energy. Approximately 86% of the total primary energy sources for all purposes are fossil – petroleum, natural gas, and a small amount of coal.

The following chart indicates the major primary energy sources for San Francisco for all purposes, including transportation.<sup>ii</sup>

**San Francisco Primary Energy Sources**



The following chart indicates the end usage of all energy sources in San Francisco.<sup>iii</sup>



### 5.1.1 Three Principal Energy Sinks (As reflected in the usage chart above)

#### 1) Vehicle Fuel ~45%

Over 95% of the petroleum fuels used in San Francisco are used in transportation as vehicle fuel. The Task Force Report includes a section dedicated to the issue of transportation. Please refer to that section for information regarding that sector. Some modes of transportation depend on grid electricity. Some scenarios for future mobility include substantial increases in the availability and use of plug-in hybrid electric vehicles (PHEVs) and pure Electric Vehicles (EVs), as well as electrification of currently non-electrified transit lines. In these scenarios, significant increases in the electrical load on the grid are projected. The City must anticipate this potential increase in its forecasts.

#### 2) Electrical Generation & Use<sup>iv</sup> ~30%

Total electricity consumption for the city in 2007 (the latest year available) was 5.5 gigawatt-hours (GWh).<sup>v</sup> Total usage in the city peaks at about 900 megawatts (MW,

equal to one million watts).<sup>vi</sup> A gigawatt is one billion watts, or one thousand megawatts.<sup>vii</sup>

The electricity produced for and used by the city falls within three categories: that provided by PG&E to residential and commercial ratepayers (~78%); that provided by the San Francisco Public Utilities Commission (SFPUC) mostly for powering municipal buildings and services (12-16%); and that which is provided to large commercial customers via “direct access” a holdover from the deregulation experiment of the late 1990s and early 2000s (6-10%).<sup>viii</sup> Note that this analysis does not take into account fuel-to-electricity transformation loss. Statewide, these losses amount to about 53%.<sup>ix</sup>

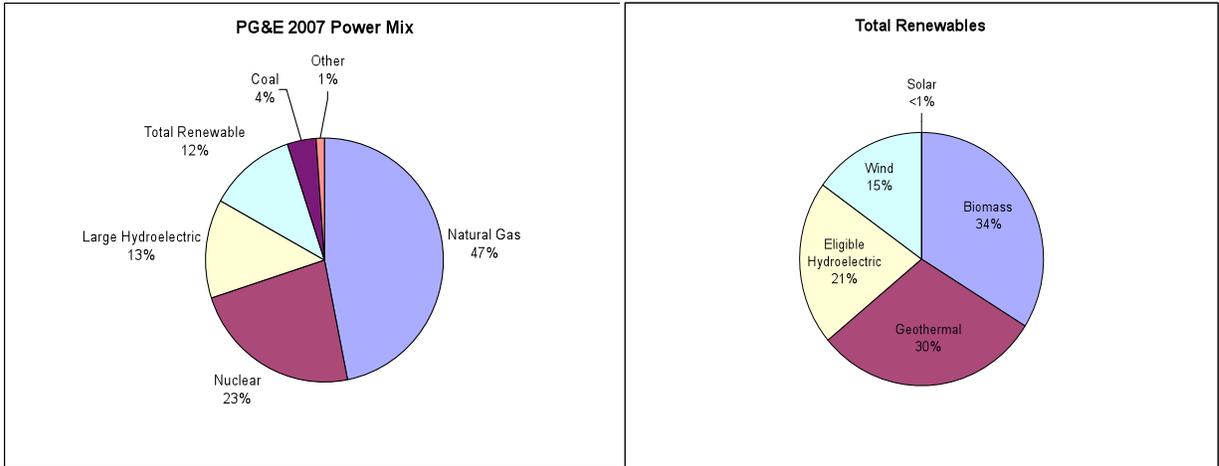
Petroleum is not a component of the electricity generation power mix for San Francisco. Although oil is not currently used directly for power generation, it must be acknowledged that oil is necessary in the *platform* that allows non-petroleum energy systems to function. For example, petroleum fuels are used in vehicles that deliver supplies and help maintain infrastructure, and many components of systems and infrastructure currently require petroleum inputs. In follow-up studies, the City should assess the degree to which its non-petroleum energy sources depend on a petroleum platform.

### **Pacific Gas & Electric (PG&E)**

PG&E is a privately held corporation that provides natural gas and electric service to approximately 15 million people in a 70,000 square mile service area in northern and central California that includes San Francisco, but excluding power for municipal buildings, Muni, streetlights, and other City services.<sup>x</sup>

Action that may be required to rapidly adapt to Peak Oil and Gas impacts may include measures, such as a robust program to increase and expand distributed generation, that would probably not be in the best interest of shareholders and salary recipients in the PG&E for-profit model. As long as the major portion of power-provision to the city remains in the hands of a privately held corporation, the ability of the City to take meaningful action will be significantly limited.

**PG&E Power Mix - 2007<sup>xi</sup>** (Refers solely to electricity generation)

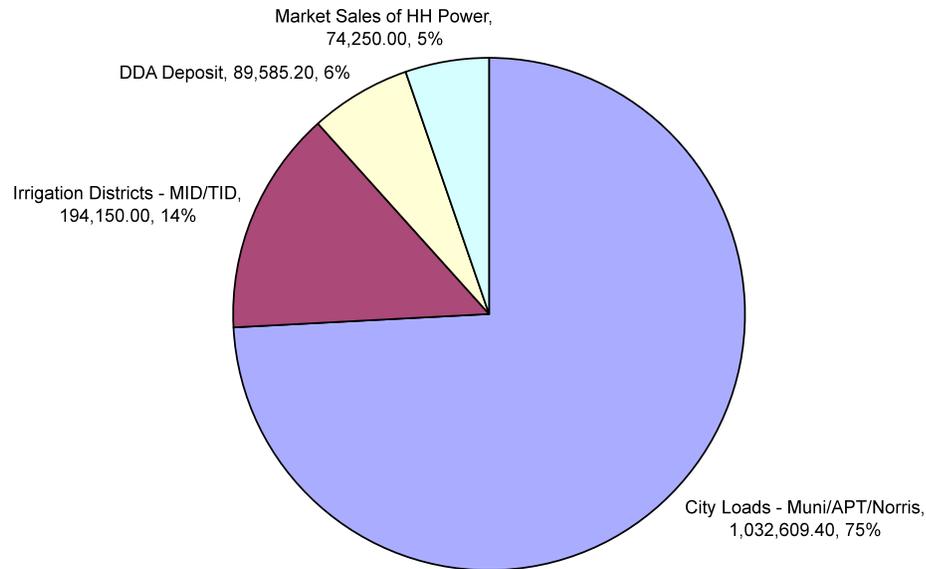


The Chart on the left represents all of the primary sources for PG&E’s generation of electricity. The chart on the right is the breakdown of the turquoise “Total Renewable 12%” wedge, indicating the primary energy sources that comprise that wedge.

**SFPUC**

The SFPUC provides electric power derived from the water impounded at Hetch Hetchy (HH) to meet the municipal requirements of the City, including power to operate Muni streetcars and electric buses, street and traffic lights, municipal buildings, SFO, SFUSD, City College, and other City facilities. This totals about 140MW and comprises between 12 and 16% of total electrical power use in San Francisco.<sup>xii</sup>

### Hetch Hetchy Loads (MWh)



In the pie chart above, “Irrigation Districts” are Modesto and Turlock, DDA (Deferred Delivery Account) deposits represent excess energy that HH banks with PG&E under the terms of its interconnection agreement, and which can be withdrawn at later date for City loads or to sell to the market. DDA withdrawals are for all intents and purposes considered Hetch Hetchy power. “Norris” refers to Norris Industries, a federal munitions factory in Riverbank, CA.<sup>xiii</sup>

Total power generated via HH averages about 1.6 billion kWh per year with a peak capacity of ~410MW. Under the provisions of the Raker Act<sup>xiv</sup>, San Francisco can draw what it needs for its own use before allocating any to the Turlock and Modesto Irrigation Districts, or any others after that. SFPUC depends on, and pays PG&E for transmission and distribution.

SFPUC operates as a water project. In the dry season, HH stops “spilling” water and SFPUC purchases power, primarily geothermal, until spilling resumes during the rainy season. It may be possible for the City to increase its capacity from this resource to accommodate increased transit electrification and/or EV battery charging.

### 3. Direct Use of Natural Gas ~25%

Total residential use for 2007 was 152.2 million therms, up from 148.1 million therms in 2006.<sup>xv</sup> Total non-residential use for 2007 was 104.2 million therms, down from 115.1 million therms in 2006. Natural gas is used for space heating, water heating and cooking in the residential sector and for industrial processes, space heating, water heating, and

cooking in the commercial sector. Currently it is not possible to know what the specific breakdown is with any precision for each of these end uses, since this would require installing individual meters on thousands of systems and appliances throughout the city.

### **5.1.2 Conservation, Energy Efficiency, and Renewable Energy: Existing Programs and Plans**

In the early 2000s, the City produced an Electricity Resources Plan (ERP), developed by the Rocky Mountain Institute, and commissioned the SFPUC and the San Francisco Department of the Environment (SFE) to carry out the Plan. Many of the objectives in the ERP have been met and many other factors have emerged since the early 2000s. Also true is that many of the goals, such as those for renewably-generated power, have not been achieved. These two documents remain the plans under which the City operates with respect to electrical resources. The City should direct SFE and SFPUC to work together to produce an updated, integrated long term energy/electricity resource plan that takes the downside of the peak into consideration.

The City has a wide variety of conservation, energy efficiency, and renewable energy programs and plans underway. Most of them can be reviewed at the City's and the SFPUC's websites. Rather than listing them all here, many of them will be referenced as part of the mitigation strategies proposed later in this section. Their significance to Peak Oil & Gas is that rapidly increasing conservation, energy efficiency, and renewable energy in the city is a key meaningful response to the problem.

## **5.2 Vulnerabilities**

The principal vulnerability is that approximately 86% of the sources of energy that San Franciscans use to power their lives are fossil fuel sources - petroleum, natural gas, and coal. None of these sources are derived from within the City's boundary. In fact, San Francisco has limited capacity to generate any kind of power within its political boundary due to the fact that it is "built out" and very little developable land remains within the City. This leaves rooftops, parking areas, and a few areas of open space as possibilities for energy generation within the City. It is not realistic at this time, given the current technology and current demand, to meet the demand with renewable power generated within the City, therefore, San Francisco will continue to depend on transmission of power generated elsewhere.

San Francisco is perched at the end of a long narrow peninsula. This has presented vulnerabilities for the city relative to transmission of electricity into the city, since conventional transmission is land-based, requiring that wheeled power must enter the city from the south. Land-based transmission lines are also the least costly way to wheel power. However, the new Trans-Bay Cable from Pittsburg will bring up to 400MW of power to the city via a transmission line beneath the bay.<sup>xvi</sup> The source of power transmitted via the cable remains an issue of concern. Although challenging in the transmission context, the fact that the city is surrounded by water may be advantageous in

some respects, for example, offshore wind, tidal, ocean wave, and marine current power generation potential.

A third, but not least major vulnerability is a populace that is woefully unaware of the predicament that the city and society at large will face as the global extraction peak is passed and we are forced to learn to live in a contracting energy environment.

### 5.2.1 Petroleum

This is covered very briefly here because it is addressed more thoroughly in the Transportation Section and other areas of the Report.

Supply - Supply estimates from respected petroleum geologists range from some who point to evidence that global production is currently peaking, to most estimating the very near future (within a decade), to a very few optimists estimating some time around 2030. [see appendix?] Even if the 2030 estimate is closer to the truth, it is not too early to begin adapting. Total planetary endowment is conventionally estimated at 2 trillion bbls prior to commercial extraction, with about 1 trillion bbls remaining – the more difficult-to-extract trillion. Global production has been roughly flat since 2005 at about 87mbd.

Price - Oil prices are currently very volatile and difficult to predict. In August 2008 the price of oil was at about \$150/bbl and at the time of this writing it is at about \$50/bbl and slowly rising. Price of oil at a given time is not necessarily an indicator of the proximity of the peak, although this kind of volatility has been predicted as a part of the experience of living through the peak. Daily oil price is a micro-metric; Peak Oil is a macro problem. It is a mistake to think that the peak is not an immediate problem, merely because the current price of oil is relatively low. An analogy would be arguing that climate change is not a problem because we are having some cold weather.

*"Last summer's [2008] \$4-a-gallon gas was no anomaly, it was a brief glimpse of our future. We must address the inevitability of peak oil by developing vehicles powered by alternatives."*  
Irv Miller, Vice President, Toyota USA  
News Release of 1/10/09

End Uses - Over 95% of petroleum fuel is used for transportation purposes. The remainder is used in industrial applications. Petroleum as a vehicle fuel is replaceable on a small scale, but on the large scale required to replace all petroleum fuels, physical barriers come into play that makes simply replacing these fuels highly unlikely. Some petroleum diesel is used for emergency back-up generators in hospitals and other facilities that cannot afford a blackout. If sustainably-produced biodiesel is not available, these generators will be vulnerable.

### 5.2.2 Natural Gas

Supply - Natural gas production peaked in the U.S. in 1973.<sup>xvii</sup> However, in recent years, production has increased nearly to the level of this historic peak due to an increase in the production of unconventional resources and improvements in natural gas drilling technology. The fact that unconventional resources and methods are being employed should be taken as an indicator that production from easy-to-access

conventional reserves and discovery are not keeping pace with demand. California and San Francisco increasingly rely on natural gas imported via pipeline. Supplies from overseas can be liquefied and shipped then returned to the gaseous state for end use, but this system is dangerous, controversial, unreliable, and requires significant long term infrastructure investment for supply that cannot be guaranteed. Even so, LNG will undoubtedly be traded more and more on the international market in the coming years.

Ÿ Price - It is likely that the price of natural gas will become a limiting factor before economically significant shortages of supply become a reality. The eventual high prices due to competition for a dwindling resource, and other factors, will render natural gas effectively unavailable. Prices are notoriously difficult to predict with accuracy. Therefore, the Task Force recommends that the City adopt a general policy of erring on the side of high price estimates when conducting forecasts in this regard. For the periods when high estimated prices do not materialize, the City and consumers will benefit by unexpectedly lower prices. If prices are at or above anticipated estimates, the City will be better prepared than if lower estimates had been used.

Ÿ End Uses - All direct consumers of natural gas will be vulnerable to price hikes. Electrical ratepayers will remain very vulnerable to price increases as long electrical generation remains so dependent on natural gas. Gas, like oil, is ultimately a finite resource. It would be prudent to begin the process of transitioning away from these resources now.

**5.2.3 Coal** - The City should avoid strategies that conflict with other environmental and climate change goals. Although coal is the largest single source of fuel for the generation of electricity worldwide, the city uses very little for this purpose, or for any other purpose. Therefore, the Task Force does not anticipate that coal prices or supply will be a significant factor in energy decision-making for the City in the foreseeable future. This does not imply that San Francisco will be immune to economic impacts in the broader U.S. and international context due to future coal price/supply fluctuations. The risk also exists that energy decision-making that is not in the hands of the City government may result in an increase in coal use to generate power in remote locations for wheeling to the city. Although coal exists in far greater quantity than oil or gas, extraction and combustion impacts, not the least being the impact to the global climate, will probably inhibit fully exploiting this resource. The Task Force urges the City to resist public policies that would facilitate increased coal use as a primary electricity generation source in nearby states and nationally. Similarly, and for identical reasons, coal-to-liquid fuel technology should not be considered as an option to mitigate declining petroleum supply.

**5.2.4 Nuclear Fission** - The Task Force is unanimous in its support of policy responses that advance local, clean, renewable, sustainable, environmentally just and economically viable long range alternatives to fossil fuels. These alternatives represent capital-intensive long-term infrastructure investments that will remain integral components of society for decades to come. Based on economic, public safety, security, environmental, and environmental justice considerations, the Task Force is unanimous in opposition to nuclear fission power as a near-, mid-, or long-term mitigation strategy for addressing

peak oil & gas. The City should avoid strategies that conflict with other environmental goals. Nuclear fission power poses unacceptable perils in every step of the process, from the extraction of uranium threatening Navajo communities, to the transportation of radioactive materials exposing communities to hazardous spills along transportation corridors, to the siting of monolithic reactors that are subject to catastrophic failure and/or sabotage, to the still-unresolved question of the final disposition of radioactive waste materials. Nuclear fission plants do not serve well as a stop-gap measure due to the long lead time required for commissioning, they are uninsurable in the commercial insurance industry, are not versatile in terms of scale (they come in one size - big), are difficult to site (no one wants to live near one), and are inextricably linked to nuclear weaponry. Once existing plants are decommissioned, new sources must emerge to take their place.

### **5.3 Goals and Strategies**

**5.3.1 Accelerate efforts to transition away from fossil fuels, while avoiding nuclear and coal based energy.** First, an explanation of what is prospectively being mitigated, because it is not the problem of Peak Oil & Gas that is being mitigated; there is no way for the City of San Francisco to influence the timing of the peak of global production of oil & gas. What the City is able to influence are the ways and the degree to which the peaking impacts the city. So these are *impact* mitigation strategies. Such impact mitigation largely comes in the form of reducing dependence on fossil fuels via conservation, efficiency, and deployment of non-fossil alternatives.

ÿ **Petroleum** - Accelerate efforts to improve pedestrian, bicycle and public transit options; impose disincentives on automobile use.

ÿ **Natural Gas** - Accelerate conservation programs; incentivize technologies that offset natural gas use such as solar water heaters and solar cookers.

ÿ **Coal & Nuclear** - Oppose any further development of these sources for San Francisco.

**5.3.2 General Strategy: Promote awareness of Peak Oil and Gas; predicate City planning on the expectation of rising energy prices and declining availability.**

ÿ **Create a permanent body to advance and monitor the City's responses to Peak Oil & Gas** - The first step necessary to respond meaningfully to this issue is for the City to establish a permanent programmatic mechanism that will work beyond the Task Force to produce further reports and other materials and to begin to educate City staff and the public on the issue. In lieu of a new division or department or commission, some means of promulgating peak oil preparedness measures throughout the City government and the populace at large must be defined. In order for the City to respond meaningfully in the context of what it can do for itself, the City will require an

*“Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated more than a decade in advance of peaking.” - The Hirsch Report: Peaking of World Oil Production: Impacts, Mitigation, & Risk Management - Commissioned by U.S. DoE*

ongoing commitment to the issue with City staff dedicated to carrying out, for example, infrastructure investment analysis that takes into account a constricting fossil fuel universe. It would also be in the City's interest in this regard, to operate an "Energy Transition Resource Center" that would provide information and services to residents and businesses to assist them in reducing their energy consumption.

ÿ **Develop a public education program on Peak Oil & Gas** - A principal mitigation strategy is public education. If the public is made adequately aware of the gravity of the situation, many of the things that need to be done – choosing public transit instead of a gasoline-powered car for example – will happen as a result of individual choice that is in turn the result of an effective public education campaign.

ÿ **Plan for rising energy prices and possible shortages** - It is not important that the City attempt to predict what petroleum fuel and natural gas prices might be in the future. Such predictions are unlikely to be accurate no matter how sophisticated the models used. The important thing is to anticipate more than one scenario, and at least one scenario included should be the one where prices are high enough to render petroleum fuels and natural gas effectively inaccessible. As noted earlier in this section, in 2002 the City produced an Electricity Resource plan (ERP). This plan is now becoming out-of-date, particularly in light of looming fossil fuel supply limitations. The City should produce a new Plan, similar to the 2002 ERP, retaining consideration of the drivers of that effort (environmental justice, public health, and energy deregulation) but updated to take into account fossil fuel scarcity considerations, and explicitly incorporating the goal of ending dependency on fossil fuels. The Plan should also include a requirement that, once the report is published, follow-up public meetings in the months and years ahead should be held to address the status of implementation of the plan.

ÿ **Advocate for sensible policies in light of Peak Oil & Gas at every level of government** - Mitigation strategies in response to the problem of Peak Oil will likely be subject to a similar factor that mitigation strategies for global climate change are subject to, namely, that they are both problems that are global in nature. This does not mean that the City's efforts are unimportant, but ultimately it will require concerted effort at the international level in order to respond effectively. For this reason the Task Force recommends that the City take steps that compel responses and action at the state, federal, and international levels.

### **5.3.3 Emphasize demand side management** (Corresponds to recommendation 5.4.2)

Demand reduction may turn out to be the single most important response in addressing Peak Oil & Gas. The mission at hand is not to figure out how to provide 900MW of capacity with non-fossil sources, but how to first reduce the demand significantly so that the job of powering the city is a less daunting one. Because San Francisco gets approximately 84% of its energy from oil and natural gas, it will be virtually impossible to replace that fast enough watt for watt with renewable energy. All of the alternative energy possibilities discussed below will likely only fill a fraction of current energy

demand before oil and gas supplies begin to fall, given current technology. Therefore, reducing demand is imperative. The Community Choice Aggregation (CCA) business plan lays out a road map for achieving an 11% reduction in electricity demand - 2% of total energy - through efficiency and conservation. The City should adopt and pursue at least that much. Below are several proposed strategies on the demand side.

**ÿ Reduce use of energy in San Francisco through conservation and energy efficiency** - Conservation comes first. It is the best way to adapt to limited resources of any kind. Strictly speaking, conservation and energy efficiency are two different things, but they are closely related. Energy efficiency is a form of conservation. Energy efficiency means using a low wattage compact fluorescent light bulb that puts out as much light as a higher watt incandescent bulb. Conservation means turning off the light. Most of what this report will recommend falls under the category of energy efficiency technology implementation. However, the Task Force feels that the City should not discount the value of promoting conservation as a public education imperative. New or expanded energy efficiency measures have the potential to give the City the greatest “bang for the buck” in terms of mitigating demand. The CCA plan mandates 107 “negawatts” or MW *not used* as a result of energy efficiency and conservation. This is not necessarily the maximum that can be achieved. At the time of this writing, PG&E is in negotiations with the CPUC for renewal of Section 381 funds. These funds are derived from a fee on ratepayer’s bills, and are used for “public goods” including efficiency programs. SFE has historically partnered with PG&E in implementing these programs in the city. Assuming this relationship continues, SFE should develop much better working relationship with PG&E to administer the funds in ways that are consistent with accelerated demand reduction goals in light of Peak Oil & Gas.

**ÿ Pursue creation of a “Smart Grid” to stretch available energy further** (Corresponds to recommendation D) - The “smart grid” concept is basically to transform the current system with what is essentially an energy Internet - replacing the conventional system of monolithic, centralized power generation with little ability for the generator to communicate with the consumer within the system. The smart grid is a decentralized system where a web of interactive electronic communication exists between large generation centers, distribution nodes, smaller distributed generation, and end users. Smart meters that allow for two-way information flow are a good first step in this arena. Advantages of the smart grid are that it increases efficiency, reduces peak demand, and allows for small, distributed renewable energy generators.<sup>xviii</sup> On December 9<sup>th</sup>, 2008, the San Francisco Board of Supervisors passed Resolution 081562, establishing City policy supporting Smart Grid technology and protocols for City electric systems urging the Public Utilities Commission to prepare a study to identify the most effective and economic means to implement smart grid technology.<sup>xix</sup> This is a step in the right direction.

**ÿ Develop a green workforce to retrofit buildings for efficiency** (Corresponds to recommendation E) - Another critical component of implementing demand side mitigation measures is having the trained workforce available to do the actual work

of retrofitting buildings and installing cleaner more energy efficient systems. Powerful momentum is building on a national level to inaugurate a “green economy” that will be comprised of thousands newly trained in “green collar jobs.” Such jobs include, for example, retrofitting existing homes and businesses with weather-stripping, water heater jacketing, and installing the latest energy efficient technologies. The City can take a lead in this arena by establishing a green jobs workforce development program to train and place people in this vocation. The City should establish a green jobs workforce development program to train and place people in the skills required to install new, or upgrade, repair, reconstruct, replace, or expand existing energy efficiency and renewable energy infrastructure. CPUC funds that go to PG&E for energy efficiency programs could be used for this purpose.

#### **5.3.4 Increase production of energy from alternative sources.**

Supply side refers to the ways and means of producing power. What is needed in a follow up is an estimate of first, how much demand can be reduced, followed by how much electricity can be generated in the city, and finally adding outside sources, to get a picture of what the prospects are for powering the city. An analysis of this nature is outside the scope of this report, but is embodied in the CCA Program Plan. The following are several supply side strategies, followed by a summary of some of the emerging non-fossil technologies.

##### **Y Prioritize the implementation of CCA to establish control of our local energy system and accelerate deployment of renewable energy technologies**

(Corresponds to recommendation 5.4.1) - CCA is a program enabled under state law that allows the City to become an electricity purchaser for residents and businesses currently served by PG&E. Ratepayers are able to opt-out and remain full customers of PG&E if they prefer, and PG&E may continue to provide electricity transmission, distribution, meter reading, and billing services under the CCA program. The main advantage of CCA relative to Peak Oil & Gas is that the City has the ability to choose non-fossil primary energy sources, and is not at the mercy of PG&E, which is a private corporation, for decision-making in this regard. Local control of pricing is another advantage of CCA. The CCA implementation plan calls for 360MW of non-fossil energy generation and conservation. This is comprised of 31MW of PV power, 72MW of non-solar distributed generation, such as stationary fuel cells, 150MW of wind power, and 107MW of efficiency and conservation measures.<sup>xx</sup>

##### **Y Encourage private investment in distributed generation of renewable electricity through feed-in tariffs**

(Corresponds to recommendation 5.4.7) - A feed-in tariff is a mechanism that allows small renewable generators to sell their power to utilities at predefined terms and conditions. In essence, small energy suppliers are guaranteed a certain price for whatever they feed into the grid, thus removing that uncertainty. This has major potential for encouraging the installation of distributed generation such as solar photovoltaic systems on non-owner-occupied buildings, by making the installation of renewable energy facilities a source of revenue to building owners. It

is an incentive structure that has led to 20% of electricity in Germany coming from renewable sources. In early 2008, the California Public Utilities Commission (CPUC) made new feed-in tariffs available for the purchase of up to 480 MW of renewable generating capacity from small facilities.<sup>xxi</sup> Pursuant to this, effective February 2008, PG&E will purchase power from customers who install eligible renewable generation up to 1.5 MW in size<sup>xxii</sup> Since PG&E is already doing this under AB1969 and CPUC supervision, the City should see if there is anything it might be able to do in this arena.

**ÿ Create a city-wide Renewable Energy Plan** (Corresponds to recommendation 5.4.3) - The key to risk mitigation in this arena is diversification of the renewable energy sources at the City's disposal. There is no single energy source currently known that can replace petroleum or natural gas. It is also unlikely that any combination of known non-fossil, non-nuclear alternatives will be able to meet current or projected demand. However, some combination of all non-fossil alternatives combined with robust programs of conservation, energy efficiency, and localization, may be the best way to approach mitigation. An aggressive program, whether in the context of CCA or not, will be an inevitable key to transitioning out of the fossil fuel era. Currently, no comprehensive plan exists that would result in the City ceasing its dependence on fossil fuels for non-transportation energy use. The City - SFE, SFPUC - should produce a plan that would do so, combining robust energy demand reduction with aggressively increased cleaner renewable energy infrastructure investments. Such a plan should have near 100% clean renewable energy as its objective. This can be characterized as an updated Electricity Resource Plan or not. It can also be carried out in the context of CCA or not. It does not matter how it is done administratively, but it needs to be done.

**ÿ Accelerate development of cogeneration** - Cogeneration refers to the practice of capturing waste heat from existing industrial or commercial boilers or turbines that produce hot water and/or electricity on-site. The heat can be used for other industrial purposes or for space heating. The City carried out a limited study of the potential for cogeneration and found that there is a potential for more than 106MW capacity from places like hotels, residential high rises, and hospitals.<sup>xxiii</sup> Cogeneration should be pursued as an interim strategy to make the most of the fossil fuels currently being used to generate electricity.

**ÿ Develop a green workforce to install cleaner renewable energy technologies** - As with demand management, a trained workforce will be needed to do the work of installing new cleaner, renewable energy infrastructure on the supply side.

### **5.3.5 Continue to monitor the possibilities of obtaining energy from emerging technologies.**

The following are renewable energy sources and technologies relevant to San Francisco that are presented in this section as part of a Peak Oil & Gas response strategy. All of the following sources and technologies are in their early stages of development and offer

great potential for growth, but remain expensive relative to conventional sources. The general strategy is for the City to do what it can to rapidly accelerate the deployment of these non fossil-based prospects. One caveat is that all of these technologies produce electricity, not liquid fuels. To the extent that liquid fuels are needed, the challenge remains regarding how to translate electricity into liquid fuel. Direct use of the electricity for electrified transit and chemical battery EV charging is currently the highest efficiency scenario. A number of other technologies exist or are in development that are not mentioned here because they are not yet feasible in or near San Francisco.

## Ÿ Solar

- Ÿ Distributed Solar Photovoltaic (PV) - Solar PV refers to technologies that convert solar photons directly into electrical current. It is referred to here as “distributed” to distinguish it from concentrated solar power (CSP) addressed below. Distributed solar power systems are much smaller than conventional power plants and are *distributed* over a given geographical area. This offers several advantages over the conventional monolithic power generation paradigm in that it reduces risk of black outs, offers opportunities to increase efficiency, allows for more renewable energy systems, and minimizes risk of catastrophic accident and/or sabotage. This is a rapidly growing technology both in the economic sense and as it pertains to the technology itself. State and local incentives exist to assist home owners and businesses to install PV systems, but cost remains a principal barrier to more widespread adoption. One concern raised in the Task Force proceedings is that the manufacture of solar panels themselves is a very energy intensive endeavor that currently requires fossil fuel inputs. This is true of virtually every “alternative” energy technology. Since the technology and economics of PV are evolving rapidly, it is difficult to estimate the maximum amount of power that might eventually be achieved through this technology. A 2001 study<sup>xxiv</sup> estimated the total roof capacity of the city at 550 to 1300 GWh per year, at the high end, comparable to the total current residential electricity use in the city. The average annual solar radiation hitting San Francisco is very stable, with a standard deviation of less than 2.5%.<sup>xxv</sup> As of November 2008 there are about 924 solar PV installations in the City, totaling about 6.5MW.<sup>xxvi</sup> The mandate under CCA is 31MW, so there is a lot of potential for expansion in this arena.
- Ÿ Solar Water Heating - Solar water heating takes direct advantage of the heat energy from the sun. It is a very common, proven technology. In 2007 state assembly bill 1437 was signed into law, which authorizes the CPUC to create a \$250 million program with the goal to install 200,000 solar water heating systems throughout the state. The program is expected to be in place by 2010.<sup>xxvii</sup> There will be a lot of new activity in this arena in the city by 2010 and beyond and at the time of writing SFE is looking forward to some new market analysis of solar hot water in San Francisco.<sup>xxviii</sup> The City should promote solar thermal to offset natural gas used to heat water.

ÿ Concentrated Solar Power (CSP) - As the name implies, these facilities focus or concentrate solar energy to produce electricity by means of the extreme temperatures reached. Several types of CSP systems have been proven. CSP facilities are typically located in a remote area and the power is transmitted to the grid or load centers. A CSP facility has been operational in the Mojave Desert for many years, and several new projects have been proposed. The City should keep an eye on this as a possibility for the future. One drawback is that CSP is a newer version of the old centralized power generation paradigm.

### **ÿ Marine-Based Power Generation**

- ÿ Ocean Wave Energy Conversion - Ocean wave power generation is possible in places where enough strong, constant wind results in waves that have enough kinetic energy – a high vertical trough-to-peak differential – to allow specially designed buoys to take advantage of the differential and produce electricity. The nearest locations where this is the case, in close enough proximity to San Francisco, are off the coasts of Mendocino and Humboldt counties. Currently, PG&E is investigating the possibility of securing electricity from projects for which permits are pending. The current maximum generation estimate from the Mendocino project is 40MW. Another pending project in Humboldt County may produce up to 100MW. The total amount of electrical generation capacity possible via this type of system is estimated by the California Energy Commission to be about 8GW, so there is a lot of potential.
- ÿ Tidal Power - Between 2001 and 2008 the City investigated the possibility of harnessing the power of the tidal current flowing through the Golden Gate into and out of the San Francisco Bay. Currently the investigation is on indefinite hold.<sup>xxix</sup> In 2006 the Electric Power Research Institute (EPRI), conducted a study that initially stated that about 35 MW of electricity could be generated from the Golden Gate tidal current. However, SFPUC conducted its own feasibility study and determined that only about 10MW of extractable power exists.<sup>xxx</sup> Currently URS Corporation is carrying out another study. Under the most ideal scenario, only about one fifth of the City’s current demand can be met via this potential power source.
- ÿ Marine Current - Marine current power is generated via the offshore marine currents that are part of general ocean circulation, and that exist in most coastal areas. In San Francisco’s case, it is the California Current that moves south along the coast. This is a very new prospect and not many examples exist worldwide. The City should keep an eye on developments in this field and investigate the possibility as a San Francisco energy resource.<sup>xxxi</sup>

### **1. Wind Power**

2. Urban Wind Power - A California Energy Commission study in 2004 that looked at wind energy resource in SF found not much large scale potential

due to the lack of available undeveloped land. However, there may be some potential for smaller scale wind power installations on rooftops. The SF Urban Wind Power Task Force is investigating this prospect and a report is expected in March 2009. One of the things the City might be able to do in this arena is to provide information on wind generation to residents and businesses. SFE is currently investigating where some demonstration projects might be installed.

3. Remote Conventional Wind - SFPUC is looking into potential for wind along Hetch Hetchy corridor. Much of the state's best wind resource is already "locked up."<sup>xxxii</sup>
4. Offshore Wind - The City (SFE) is currently investigating the potential for offshore wind power but the process has just started. Offshore wind is about four times more expensive than land-based wind.<sup>xxxiii</sup> An April 2008 Stanford University study found that somewhere between 63 to 86% of California's current electricity needs can be met with offshore wind energy alone.<sup>xxxiv</sup>

ÿ **Geothermal** - Geothermal energy is energy that is obtained from the heat within the Earth. It can be used "as is" as a heating source, or can be used to produce steam to run a geothermoelectric turbine to generate electricity. The geothermal we are talking about here is not to be confused with geothermal heat pumps that take advantage of the very near-surface (<10ft.) temperature stability that allows one to take advantage of a slight differential in temperature in order to heat or cool a space. Approximately 30% of PG&E's 2007 renewable energy portfolio is derived via geothermal.

ÿ Conventional - Conventional geothermal energy is limited to areas where the resource (heat) is near the surface and readily accessible. San Francisco has a large conventional geothermal resource located only 75 miles away, the Geysers, mostly owned by Calpine Corporation. It is this source that PG&E is using to meet its state mandated 2010 Renewable Portfolio Standard (RPS) requirement. In 2007 PG&E contracted to purchase about 25MW of power from the Geysers that will come online in 2010.<sup>xxxv</sup>

ÿ Enhanced - Enhanced geothermal, also known as hot dry rock geothermal, refers to a relatively new technology where very deep bore holes are drilled, water is injected, and hot water or steam emerges from a secondary production well. The DoE recently invested over \$40M in this technology and a test project at the Geysers is included in the funding.<sup>xxxvi</sup>

ÿ **Biomass and Biogas** - Biomass is exactly what it sounds like, large quantities of biological matter. Biological matter contains potential energy, typically in the form of methane gas. The City operates a 2MW biogas-to-electricity generating system at the Southeast Treatment Plant.<sup>xxxvii</sup> Approximately 34% of PG&E's 2007 renewable energy portfolio is derived from biomass.

Ÿ **Nuclear Fusion** - At the time of the writing of this report, nuclear fusion power, hot or cold, had not reached commercial scale break-even.<sup>xxxviii</sup>

**Non Primary-source technologies** - The following two items are not energy sources per se, but have been proposed as means of generating electricity within the City.

1. **Combustion Turbines** - Combustion turbines (CTs) are stationary engines that run on natural gas or liquid fuels for the purpose of producing electricity. CTs have been proposed as a means of increasing in-City electrical generation. The advantages are that they can be scaled to a wide range of sizes to suit a variety of applications, and they can be located very close to load centers, and even on-site. But the City should avoid investments in energy facilities which will depend on depleting energy sources. As currently proposed, CTs are an example of this. Money proposed for the CTs would be better spent on renewable technologies.
2. **Stationary Hydrogen Fuel Cell Stacks** - A fuel cell is a device that uses fuel to produce electricity via chemical reaction. Fuel cells are a long-proven and gradually improving technology but they remain expensive. As the technology improves and manufacturing costs are reduced, stationary fuel cells may become a significant option for onsite generation of electricity. In the context of Peak Oil & Gas concerns, they only make sense when the hydrogen fuel that powers them is produced via clean renewable non-fossil energy sources. Significant improvements in hydrogen storage and transportation technologies will also be required to make general use of fuel cells feasible.

## **5.4 Recommendations**

### **5.4.1 Implement Community Choice Aggregation**

### **5.4.2 Contract an independent city-wide energy waste audit**

### **5.4.3 Produce a new Electricity Resource Plan**

### **5.4.4 Develop smart grid technology**

### **5.4.5 Advance a green jobs workforce development program**

### **5.4.6 Explore the pros & cons of feed-in tariffs**

### **5.4.7 Develop a better working relationship with PG&E to administer state energy efficiency funds in an effective way that is consistent with City goals**

*“Securing energy supplies and speeding up the transition to a low carbon energy system both call for radical action by governments - at the national and local levels...”*  
- International Energy Agency, World Energy Outlook 2008

#### **5.4.8 Seek ways to maximize the City's influence on primary energy resource decision-making**

The following people provided valuable insight and/or expertise and/or materials in the preparation of this section of the Report:

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## **4. ECONOMY**

### **4.1 Assessment:**

All industrial economies are utterly dependent upon energy. Energy powers our manufacturing plants, runs the computers of our information technology sector, underpins our research, keeps the lights on for financial companies, and keeps the transportation system moving. This is not to say that energy is a huge cost; on the contrary, the United States Bureau of Economic Analysis calculates that every \$100 of GDP required \$2.0 of energy input.<sup>1</sup> Considering how ubiquitous energy is in the economy, this seems surprisingly minimal. What this tells us is not that energy is unimportant in the economy; indeed, it is vital. The point is that energy has been very, very cheap.

According to the Energy Information Agency of the US Department of Energy, in 2006, 62% of all energy used in the United States was generated from petroleum liquids or natural gas.<sup>2</sup>

**SAN FRANCISCO:** San Francisco's economy has historically been extremely vibrant and independent. Because of its strong trading ties, especially with Asia, San Francisco is less dependent upon the vagaries of the United States economy than many other places. However, as other economies are damaged by peak oil, San Francisco will feel the effect.

San Francisco's economy is powered by three key sectors:

**EXPERIENCE SECTOR:** The “experience sector” refers to the business of hosting visitors to the city. Currently, the experience sector employs approximately 72,000 people in San Francisco,<sup>3</sup> or about 10% of the city’s work force. Visitors to San Francisco fall into four main categories: meeting attendees, business travelers, vacationers, and local leisure visitors. Of these, convention/meeting travelers are the most important to the economy, because they spend approximately twice as much per person per day as the average visitor.

About one in every four passengers at SFO arrives on an international flight. Fourteen percent of visitors to San Francisco are foreign. Short term, the foreign visitor trade may benefit from the expected decline of the dollar, particularly relative to the euro. The euro is a very relevant currency, because the top five countries sending tourists to San Francisco are the United Kingdom, Japan, Germany, France, and Australia. China may contribute more visitors in the future, as bureaucratic obstacles to leisure travel from China are removed.

**FINANCIAL SECTOR:** In common with most cities, San Francisco is dependent on exports to pay for the food, energy, and goods it needs. San Francisco’s premiere export is financial services of various kinds. Securities sales and banking services make up 40% of the city’s export earnings.<sup>4</sup> As we know, this sector has been hit hard by US economic woes.

**KNOWLEDGE SECTOR:** San Francisco is home to a growing concentration of technology-driven businesses. One is the biotech cluster centered around the new California Institute for Quantitative Biomedical Research (known as QB3). Also, in common with many cities, San Francisco is working to develop a local green energy business sector. Among others, the Mayor’s Office of Economic and Workforce Development sponsors *CityBuild*, a training and internship program in conjunction with San Francisco City College.

**TRADE:** Since the end of World War II, there has been a revolution in the shipment of cargo. The cost of air freight has fallen precipitously, while the cost of water shipping has risen somewhat.<sup>5</sup> The introduction of containerized shipping was expected to lower costs, but that has not happened. This globalization has involved not only increasing shipments of finished goods, but also international sourcing of components. “Just in time” inventory systems have put a premium on speedy delivery of parts.

Though there is no theoretical reason why it should be so, 80% of all international shipments have transport costs of no more than 4% of value.<sup>6</sup> As long as there are huge differences in labor costs between countries, most trade will be relatively insensitive to fuel price changes. This is a result of the extremely low cost of energy. A study done in 2006 estimated that shipping costs would need to rise by at least a factor of ten before transportation costs would be the limiting factor on trade<sup>vi</sup>. Shipping costs have been so low that the economic literature is full of papers questioning why there is not *more* international trade.

Oil tankers are one of every four large trading vessels,<sup>7</sup> and the third biggest commodity import processed through the Port of Oakland.<sup>9</sup> (Beverages are number one.)

San Francisco has historically been a port city. Though the physical port has declined in importance, San Francisco's economy retains strong ties to international economies.

Because San Francisco's manufacturing sector is extremely small, the city is reliant upon imported goods. Long distance imports may come by ship to the Port of Oakland, or by air freight, but the last leg of travel to San Francisco is by truck, with few exceptions. See the Transportation Section of this report for a more complete discussion of freight hauling.

#### **CITY REVENUES:**

Sales tax = \$108 million (4% of general fund revenues)

(In 2006, sales taxes on gasoline sales accounted for approximately \$15 million, 0.5 % of general fund revenues)

Hotel tax = \$143 million (5.4%)

Payroll tax = \$337 million (12.7%)

Property taxes = \$888 million (33.5%)

Utility users tax = \$79 million (3%)

Parking tax = \$36 million (1.4%)

Garages - parks and rec = \$9 million (.3%)

Revenues from Federal and CA governments = \$663 million (25%)

Total revenues = \$2.6 billion (06-07 fiscal year)}<sup>10</sup>

The biggest single source of income to the city is property tax revenues, currently one-third of the total. Property taxes move with real estate prices and level of activity. Though prices have fallen less than 20% in the current downturn, fewer sales are taking place, resulting in lower transaction tax revenues.<sup>11</sup>

The second biggest source of general fund revenues, transfers from the state and federal governments, are already falling, in response to declining revenue at higher levels of government. It remains to be seen what the federal government will do in the way of fiscal stimulus. For now, the loss of this revenue is pinching the city's budget.

The San Francisco Convention and Visitors' Bureau estimates that its industry generates \$473 million in city tax revenues, 18% of the total city budget. This is comprised of sales tax, payroll tax and hotel tax, including transfer tax on sale of hotels.<sup>3</sup>

Note that sales tax on gasoline makes up less than 1% of city revenues.

**SAN FRANCISCO INTERNATIONAL AIRPORT (SFO):** The airport is a major gateway to San Francisco. For a discussion of freight and passenger travel, see the Transportation Section. This section will consider the airport's financial stability.

Following the construction of the new international terminal, the airport has \$3.8 billion in bond debt.<sup>12</sup> SFO is required to achieve a balanced budget. The main source of revenues is landing fees, which are based on tonnage landed for both cargo and passenger travel. Cargo traffic is a minor part of San Francisco's revenues, less than 6%. Air cargo is split pretty evenly with Oakland Airport. Through June 2008, SFO has not seen a decline in landing fees, as international flights have held up, and 2008 saw three new carriers begin service from San Francisco.

The airport was expecting significant growth in the future. The renovation of Terminal Two is in the early stages. Terminal One is also slated for major rebuilding.

**PORT OF SAN FRANCISCO:** The Port of San Francisco is an enterprise department of the city. Like the airport, it is required to be financially self-supporting. Most of its annual revenue of \$60 million is from lease revenues. It has little ability to issue bonds. The Port has prepared a \$1.5 billion capital plan, much of which involves strengthening the substructures of the piers. Two-thirds of this plan is unfunded. Several piers have already crumbled into the bay.<sup>12</sup>

Funds will be difficult to find to develop the port's commercial and industrial potential, but it must be done. If the federal government makes capital available for infrastructure improvements, this would be an ideal use of such funding.

## **4.2 Vulnerabilities:**

**GENERAL:** When it comes to rising oil prices, this much is clear: Increases in oil prices have a strong negative effect on the economy in all oil-importing countries. Economists estimate that a spike in oil prices drives the economy lower, with a lag of approximately 12-18 months, but has no statistically significant effect on inflation. In other words, the demand reduction due to a damaged economy overrides the price effect. We can expect the negative effect of this spring's price spike to hit in 2009. Of course, oil is only one factor influencing the economy, though it is an important one. Sadly, it is likely to reinforce the current recession.

*"The empirical evidence suggests that a 10 percent increase in the price of oil is associated with about a 1.4 percent drop in the level of U.S. real GDP. Interestingly, increases in oil prices have no significant effect on U.S. inflation."*

*-- Keith Sill, Senior Economist, Federal Reserve Bank of Philadelphia<sup>14</sup>*

Even more striking, the effect of oil price is "asymmetric": History shows that an increase in price generates a big negative effect, but falling prices don't have a positive effect. Price volatility is a drag on the economy. In an energy-constrained world,

economic growth will increase demand for oil, driving up oil and gas prices. Rising energy costs will curb economic growth, reducing energy demand and bringing prices back down in a damaging cycle of volatility.

Though the inflationary effect of rising oil prices may be modest, the contribution of increasing oil imports to the trade deficit is a major concern. Because demand for oil is not very price sensitive, demand does not decline as fast as prices go up. For instance, from 2005 to 2006, the average price of a barrel of crude went up 19.5%, but the number of barrels of oil imported to the US declined a mere .05%. The total cost of imported oil rose over 19%, though the volume was down.<sup>15</sup> Another example: in April, 2008, the US balance of trade deficit rose 7.8%, and the increase was entirely due to a jump in payments for oil imports, though the number of barrels was down.<sup>15</sup> By increasing our trade deficit, rising oil prices put downward pressure on the dollar.

Despite the volatility of oil prices, the trend has been and will continue to be upward. Even at the recent low, the price of oil was 79% above its 2002 level, and 230% above its 1998 trough. As the price of energy rises, market forces will move us toward more efficiency. At some point, when the easy efficiency measures have been taken, the economy will begin a painful and protracted adjustment. When will that be? It's hard to predict, given the state of the economy.

The future could see the perfect economic storm. Expensive and scarce energy and the need for capital to mitigate the effects of climate change will put intense pressure on our financial system. As the economy begins to recover, rising oil and gas prices will constrain it again.

Even if the economy as a whole is not pushed into an extended recession, there will be dislocations because some sectors will be more strongly impacted than others. Trucking and air travel will feel the pinch directly. Food production is also highly dependent upon oil to power equipment and as feedstock for pesticides, and upon natural gas for fertilizer. Food and personal transportation issues are discussed in separate sections of the report. Tourism will be affected by rising travel costs, and globalized trade may have seen its apex.

**SAN FRANCISCO:** San Francisco's economy is strong. Nonetheless, at base it is dependent upon the broader global and national economies. As they are damaged by the cycle of price volatility described above, San Francisco's economy will suffer too. In addition, San Francisco's economic drivers have their own vulnerabilities.

**EXPERIENCE SECTOR:** The spike in oil prices in 2008 makes clear that high fuel prices wreak havoc with the airline industry. There is no effective substitute for oil in making jet fuel. Driven by climate change considerations, the airline industry is searching for a substitute jet fuel that is not petroleum based, but still has the energy capacity per weight necessary.

"Over the last 40 years, aviation has reduced fuel burn - and therefore carbon dioxide emissions - by 70 percent, but more needs to be done," said Sebastien Remy, Head of Alternative Fuels Research Programs for Airbus. "Millions of barrels of kerosene are used each day for aircraft fuel, and worldwide demand is growing. In order to replace a significant portion of that jet fuel with bio-jet, we need to find something that has much greater yield than the current biomass sources available. Airbus believes that second-generation bio-jet could provide up to 30 percent of all commercial aviation jet fuel by 2030."<sup>8</sup>

Though it is possible to brew jet from coal or from biological sources, and successful test flights have been done, the fundamental shortcomings of biofuels remain, as spelled out in the Energy Section (Chapter 3). Should the technical problems of bio-jet fuel be solved, it is clear that it will be far more expensive than the kerosene used now. In short, it appears that the age of cheap air travel is coming to an end.

Between 1981 and 2006, US passenger air travel tripled.<sup>16</sup> But now that trend may be reversing itself. In 2008, following just a few months of high oil prices, United Airlines, which carries almost half of all passenger traffic at SFO, cut 17% of its flights. American Airlines, which carries 10% of SFO passengers, cut 12% of flights.<sup>17</sup> The interaction between rising and unstable oil prices and stumbling GDP will put increasing pressure on airline profits and probably result in a continuing downward trend in air travel.

Travel by individual auto will also be increasingly costly. In short, leisure travel will be one of the first casualties of peak oil. The market for the remaining travelers will be extremely competitive.

One mitigation will be the probable increase in local visitors. Of the 16 million visitors to San Francisco in 2007, 4 million came from the surrounding area<sup>3</sup>. As long distance travel becomes more expensive, one would expect to have more local visitors. However, local tourists spend 40% less per visit, and are less likely to stay in a hotel, thus contributing less to San Francisco's economy.<sup>3</sup>

In sum, the days of affordable long-distance travel are coming to an end. Though various factors will mitigate the decline, the handwriting is on the wall. In the low-carbon future, visitors will be primarily local and/or wealthy. San Francisco is very well positioned to capture a large share of the market, but it will definitely be a shrinking pie.

**KNOWLEDGE SECTOR:** Technology, engineering, and consulting are not energy intensive, but they are sensitive to economic trends. As energy decline progresses, tax revenues to fund research may fall off. Capital expenditures could also be down.

**FINANCIAL SECTOR:** As we know, this sector has been hit hard by US economic woes. Even when the financial markets begin to recover, a continuing loss of confidence in the dollar is likely.

Both the financial sector and the knowledge sector are dependent upon regular interaction with the rest of the world. As physical travel becomes more expensive, high-speed, reliable internet connectivity will become even more vital than it is today. To keep our service sectors competitive, San Francisco needs to make this a priority.

**TRADE:** Since both water and air freight are dependent on oil, it is likely that international trade will eventually decline - how soon is unclear. What is clear is that there will be a mode shift in shipping. Going forward, the historic decline in relative cost of air freight compared to rail and water shipping will reverse. Air freight will surely decline rapidly, because its fuel use per ton of cargo is approximately thirteen times as high as that of water freight. Because of its dependence on air travel, "just in time" inventory may very soon be unmanageable.

The vast majority of San Francisco's exports are services. On the one hand, service businesses are relatively impervious to fuel issues. On the other hand, they depend upon the state of the general economy.

**CITY REVENUES:** In general, San Francisco will have to do more with less. Demands on the city budget will rise at the same time as revenues fall. The city is seeing something like that now, with the difference that the squeeze on city finances due to peak oil and gas will be indefinite, if not permanent.

Though predictions vary, rising fuel prices will probably lead to an influx of new residents escaping the car dependence of the suburbs, so expect property taxes, the city's biggest source of revenue, to hold up relatively well. In the past year, for example, San Francisco real estate values have gained as much as 30% in value relative to suburban real estate. (Suburban values have fallen less than San Francisco.)<sup>11</sup>

On the other hand, transfers from the state and federal governments will be ever more pinched. San Francisco itself has far more non-fossil-fuel resources than most localities in the state and nation. The same factors that will impact the city's municipal budget will have an even greater negative impact elsewhere. Long term, the city's fortunes are tied to the future of the region, state and nation, but the better San Francisco prepares itself for the era of expensive and possibly scarce energy, the more people will be attracted to it, and the better it will fare as a metropolis.

Another big vulnerability is the 18% of San Francisco's revenues that come from the experience sector. Peak oil will reduce both the number of visitors and the amount they spend.

Meanwhile, as revenues fall, urgent needs for infrastructure projects to cope with the coming shift in transportation modes will require massive capital investment. The

Municipal Transportation Agency will especially need funds to prepare for an influx of passengers. There may be federal funds available as part of the stimulus package in 2009.

**SAN FRANCISCO INTERNATIONAL AIRPORT (SFO):** If air travel undergoes a protracted decline, the airport will be in the unenviable position of needing to raise landing fees to cover debt payments and other expenses, even as airlines struggle to survive. Currently, the airport pays \$22 million into the city's general fund each year. This payment is calculated as a percentage of the airport's revenue, which may decline.

As air travel becomes increasingly a luxury affordable only to the wealthiest elite, it could be difficult for SFO to manage its debt. Contracts with airlines are written with escalator clauses to enable the Airport to raise fees in the event that revenues fail to cover expenses.

**PORT OF SAN FRANCISCO:** The Port of San Francisco is an enterprise department of the city, but also is subject to oversight by the state. If the city allows the port to continue to deteriorate, the cost of bringing its maritime facilities into working condition will be higher and harder to raise.

### 4.3 Strategies

Constricting oil and gas supplies will cause three bad results simultaneously: a faltering economy, declining city revenues and a need for additional spending. In addition, trade will fall off. San Francisco lawmakers need to treat this situation as the structural issue it is, and not a temporary problem. The basic conceptual framework for coping:

**CITY PLANNING SHOULD TAKE RISING OIL AND GAS PRICES INTO ACCOUNT:** San Francisco uses a purchased econometric model of the city's economy. In this model, energy prices move with general inflation. In fact, the model cannot consider fast-rising energy prices. Until the recent downturn, the increase in the price of crude oil averaged over 25% per year since 2002. The model needs to be upgraded to be more realistic. If the model cannot be revised, then a separate calculation needs to be made when evaluating the effect of potential legislation.

Quite aside from the use of the econometric model, evaluations of policies and plans generally do not adequately consider energy use. San Francisco has a plethora of commissions and agencies, nearly all making plans based on past energy prices. This was a reasonable thing when energy was cheap. That assumption now needs to be changed. All city plans need to include a section explicitly assessing the effect of expensive and scarce energy.

**LOOK FOR NEW REVENUE SOURCES THAT ENCOURAGE CONSERVATION.** Enact a carbon tax. San Francisco will face declining revenues from the hotel tax and from state and federal revenue-sharing. MTA will need large infusions of cash to cope with increasing

ridership at a time of rising fuel prices. Politically, it will be difficult to enact a carbon tax large enough to be a major revenue source; however it could be part of a revenue raising package.

Another possibility would be to set a floor under gasoline and diesel prices in the city. If the market price of vehicle fuels dropped below the floor, the difference would go toward public transit. See below for a discussion of the business tax.

Other possible revenue sources include: variable parking charges, city car tax, congestion pricing tolls, impact fees on new parking spaces and garages. However, all these possibilities have the drawback that they will decline with auto use.

**PRIORITIZE HIGH-SPEED INTERNET THROUGHOUT THE CITY.** As physical transportation becomes more expensive, electronic transmission of data will be necessary to maintaining our economic functionality. A well-functioning broadband network will facilitate telecommuting, virtual conferencing, and so on, to replace face-to-face communication. Overnight letter and package services will fast become impractical due to rising air freight costs, so without an efficient on-line “shipment” system, productivity will be constrained. This will be extremely important to San Francisco, with our location on one coast and many overseas customers. The proposal to lay fiberoptic cable each time a street is dug up should be seriously considered.

**DEVELOP THE SOUTHEAST WATERFRONT TO TAKE ADVANTAGE OF THE COMING RISE IN SHORT HAUL WATER FREIGHT.** As discussed above and in the Transportation section below, the redevelopment of the port is both a challenge and an opportunity. Should Federal infrastructure funding become available, this project is ideal for submission. It needs to be a priority.

**FORMULATE A PLAN TO REVITALIZE RAIL IN SAN FRANCISCO.** A modern city needs modern freight and passenger rail service. One vital improvement is the tunnel through which trains approach the southeast waterfront. The inadequate size of the current railway tunnel is a choke point for our ability to replace trucks as virtually the only method of moving goods into San Francisco. Fixing it is the first step toward a functional freight system. Federal funds could become available for this sort of infrastructure improvement. Our plans need to make it a high priority.

Beyond the enlargement of the tunnel, San Francisco needs to formulate a plan to improve rail access to the city. When oil and gas are prohibitively expensive, electric rail will be the major transport mode. Convenient rail access will become increasingly important to maintaining the vitality of the experience sector. Cities and regions with well developed rail will be at a competitive advantage, but such development takes time. Start now.

**AVOID ORPHAN INFRASTRUCTURE.** San Francisco’s infrastructure plans need to take the long-term view. There will not be enough funding to handle all important projects, so priorities will have to be carefully set. For example, while the airport is busy today, its

future prospects are murky. Upgrades to the airport could fall into the category of orphan projects. The best plan is to wait and see, because improvement funds probably would be better spent elsewhere.

**EXPAND AND STRENGTHEN PROGRAMS FOR LOCAL SMALL BUSINESSES.** Strengthening the local core of our economy will become more important than ever as Peak Oil & Gas hits, in order to protect our residents from the bad stuff happening in the broader economy. To a certain extent, market forces will push toward localization, but there may be dislocations. Also, cities and regions that act now to prepare will fare better in the transition time.

The City needs to create local sources of key resources. The Board of Supervisors should direct the Controller's Office to begin studying the city's balance of trade to identify pivotal imports. Then the Economic Strategy Report needs to be expanded to include a strategic plan to locally source vital inputs to our economy. Local control over two of the most important ones, food and energy, is top priority. These items are discussed in subsequent chapters of this report. However, these are far from the only inputs to look at. If we knew the composition of San Francisco's balance of trade, we could identify other vulnerabilities and begin to plan to mitigate them.

There is a great opportunity for small, local business to gain in importance as trade declines. This is not a bad thing, because small business generate new jobs. According to a 2006 study by Kent Sims, a former city economist, small businesses are more reliable employers in bad economic times than large companies.<sup>18</sup> They also keep profits local. San Francisco should take advantage of the changing economy to become more economically sustainable.

City government could push much harder to promote small businesses. San Francisco could use its financial might to pressure its own bankers to invest in and loan to local businesses. There is already legislation on the books, the Community Reinvestment Act, which requires that banks that do business here devote a portion of their lending to the local community. This legislation needs to be strengthened -- and enforced.

San Francisco could also use its own purchases to give market support to local business. Such a policy is in place, but is not enforced.

The City could also make it easy to invest in local businesses. Banks who want to do business in the city could be required to support a local venture capital fund, including a local micro-finance fund. This fund could also accept direct investment from local small investors, allowing neighbors to invest in neighborhood businesses. [Here's one example of an opportunity San Francisco is missing: The California Clean Tech Open Competition is a contest held right here in San Francisco for putative clean tech startups. Most of the winners are local; many are students at the Presidio School of Management. The 2008 winners got seed money -- and free rent for a year in San Jose.]

San Francisco needs to orient the business tax toward small businesses by making it progressive, based on gross receipts, not payroll, with an exemption for micro businesses. Such a tax change could raise needed revenue too.

**\*\*Recommendations\*\***

**Require the Controller's Office and other departments to consider rising energy prices when evaluating potential policies and legislation.**

**Direct the Office of Economic and Workforce Development to revise the *Economic Strategy Report* in light of increasing fossil fuel prices.**

**Direct the Controller's Office to prepare a report on San Francisco's balance of trade, with attention to identifying key imports. Follow this with the creation of a strategic plan to find or develop local sources of these inputs.**

**Expand and enforce the City's own policy of sourcing locally for city purchases.**

**Resume development of a project to make high-speed internet available to all residents throughout the city.**

**Establish local venture capital and micro-lending funds.**

**Revise the City's business tax to be assessed on gross receipts as it used to be, and to be progressive, with an exemption for the smallest businesses.**

**Look for new revenue sources for city government to fund the transition despite declining revenues from current sources:**

- Carbon tax**
- Progressive business tax**
- Demand-sensitive parking fees**
- City vehicle tax**
- Gasoline tax based on price floor**

**Develop the southeast waterfront to take advantage of the coming rise in short haul water freight.**

**Evaluate plans for new or improved infrastructure to avoid "orphan" projects which will lose their rationale in light of Peak Oil and Gas.**

**Enlarge the railway tunnel giving access to the port.**

**Formulate a plan to build a modern freight rail facility in San Francisco.**

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## **ENDNOTES:**

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# **SAN FRANCISCO PEAK OIL PREPAREDNESS TASK FORCE**

## **REPORT**

### **5. Food Security**

#### *Assessment of Current Realities*

The US's industrial food system is dangerously dependent on petroleum, and when fuel shortages eventually occur, this dependence will compromise our ability to grow the food we need for our basic survival.

Although you don't find any oil on your dinner plate, petroleum and other fossil fuels are inside almost every bite we eat. At least one-tenth of all US energy is swallowed by our highly industrialized and centralized food system.<sup>xxxix</sup> The synthetic nitrogen fertilizers that are essential for high crop yields are a byproduct of natural gas. Gasoline and diesel fuels power the combines that rumble through the grain fields. Millions of kilowatts of electricity are burned up in the factories that process the packaged goods that line the supermarket shelves. And then there's the fuel required simply to get food to market. We now have a globalized food system, one in which the typical American meal travels 1,500 miles from farm to fork. Organic products — though they may have a more sustainable veneer — are in many respects no different; 10 percent of organic products come from abroad.

According to Peak Oil researcher Richard Heinberg, for every calorie of food we produce, we need to expend about 10 calories of fossil fuels.<sup>xl</sup> This is an unsustainable equation. Under our current food system, an interruption in petroleum supplies would put us all on a strict diet.

The dangerously tight connection between oil and food was on display last year when high oil costs contributed to a spike in commodity prices. In 2008, global prices for crucial commodities such as corn, wheat, and rice doubled or even tripled, sparking food riots around the world. In the US, food continues to be abundant, but consumers have also been hit with rising costs: The price of eggs rose about 40 percent in 2008, and has only slowly come back down.<sup>xli</sup>

There are several reasons for skyrocketing food prices. Climate change is likely playing a role. The biofuels boom is also a culprit, as significant acreage is set aside to cultivate crops that — in the words of author Raj Patel — are being “set on fire.” The volatility in fossil fuel prices has also forced food production costs

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upward. Artificial nitrogen fertilizers are a key example. According to the US Department of Agriculture, in 2007 farmers were paying more than twice as much for fertilizers as they were in 2000.<sup>xliii</sup> As *New York Times* columnist Paul Krugman has put it, “Cheap food, like cheap oil, may be a thing of the past.”<sup>xliii</sup>

Fortunately, San Francisco is blessed to be located within a region of impressive agricultural assets — from the grape-growing hillsides of Sonoma and Napa to the fertile soils of the Sacramento Valley to the decimated but still extant orchards of the far East Bay. California’s mild Mediterranean climate is ideal for growing a diverse range of fruits, vegetables and grains, and the oak and grassland savannah of the state is perfect for grazing livestock.

At the same time, the region enjoys important cultural advantages. San Francisco is among the “foodie” capitals of the country, and the appreciation for fine foods has helped re-establish regional food systems via farmers markets, Community Supported Agricultural (CSA) programs, and restaurants and groceries that prioritize selling locally produced foods. According to a report published in September 2008 by the American Farmland Trust and Sustainable Agriculture Education (SAGE), in the San Francisco “foodshed,” food production for sale directly to customers is increasing at about 9 percent a year.<sup>xliv</sup>

The San Francisco Foodshed Assessment by SAGE and American Farmland Trust concentrated its research on the food produced within a 100-mile radius of the Golden Gate Bridge. While this is an essentially arbitrary number (it excludes important food producing counties such as Fresno and Tulare), the 100-mile figure is useful shorthand for defining a “local” food system in a petroleum-scarce future.

The Foodshed Assessment discovered that, in gross aggregate terms, the region is food self-sufficient. The City and County of San Francisco consumes about 935,000 tons of food a year; the Bay Area as a whole eats about 5.9 million tons of food annually. Within the 100-mile radius, roughly 20 million tons of food — including more than 80 separate commodities — are produced a year. The region is, in fact, capable of growing enough food to feed itself.

But the picture becomes more complicated when considering exactly what types of foods are produced, and where they are eventually eaten. Northern

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California agriculture — a \$10 billion industry, or one-quarter of the state’s total food economy — is highly concentrated on the most lucrative fruits, vegetables, nuts, and dairy products. Grains account for only four percent of the foodshed’s agricultural production. This is less an issue of environmental capacity — many grains can thrive in the area’s soils and climates — than it is a matter of economics. It is not financially wise to grow bulk commodities on expensive land.

The Foodshed Assessment concluded that certain key foods are not currently grown sufficiently to meet the region’s needs: eggs, citrus fruit, wheat, corn, pork, and potatoes.

Our globalized food system is to blame for the contradiction of simultaneous abundance and scarcity. Much of the food grown in the region is destined for export to other parts of the country — or even, in the case of wine grapes, other parts of the world. The rich soils of the Salinas Valley in Monterey County are a good example of the dynamics at play. The area accounts for one-third of the vegetable production in the foodshed study area. Yet the vast majority of the area’s harvest is consumed in other parts of the US; the Salinas Valley, often referred to as “The Nation’s Salad Bowl,” grows more than half of the lettuce eaten in the US.

While salad mix, almonds, and wine might make for a nice appetizer, it’s hardly a recipe for a well-balanced diet. Farmers and policy makers need to reconsider whether growing food for export is the wisest course, and whether the region’s fertile soils couldn’t be better used to grow a variety of crops for regional consumption. Yolo County organic grower Paul Muller of Full Belly Farm summarizes the challenge: “We have spent 100 years dismantling America’s local food systems. It’s time to grow them back.”<sup>xlv</sup>

### *Vulnerabilities*

The global food system’s susceptibility to fossil fuel price increases poses a major challenge to maintaining food security in San Francisco. As fuel prices rise, they will push food costs upward. At first, this will mean additional stress on families’ budgets as City residents are pressed to maintain their food consumption habits. While rising food costs will affect all San Franciscans, pressures will be

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especially acute for City households that are already on the brink of hunger. According to the San Francisco Food Bank, nearly 150,000 residents — or almost one-fifth of the population — are currently at risk of hunger.<sup>xlvi</sup>

The greater risk is that price shocks will eventually translate into physical shortages, and that food will become scarce for all residents, regardless of income levels. Such a scenario is nothing short of a public health emergency.

If that were to occur, the food crisis would not be limited to San Francisco, of course, but would likely affect the nation as a whole. This is the key weakness of a globalized food system: All local communities are vulnerable to disruptions in the long and complicated industrial food chain. The best strategy to reduce this vulnerability, then, is to re-regionalize our food system.

### *Mitigation Strategies*

To meet the Peak Oil challenge and create a largely fossil fuel-free food system, San Francisco must pursue two key policy tracks. The first is to work with regional policy makers (such as ABAG, the Association of Bay Area Governments) to encourage diversified regional food production while at the same time strengthening regional freight networks by investing in rail and water transport. The second is to vastly increase San Francisco food production by encouraging vacant or underutilized land to be used for gardening and to equip residents with the skills and materials they need to be successful gardeners.

It should be noted that these parallel efforts are closely related. As San Francisco begins to distinguish itself as a leader in urban food cultivation, City leaders will be better poised to encourage other Bay Area officials to reconsider their current land use policies.

### *Diversify Regional Agriculture and Rebuild Efficient Transportation Networks*

A century ago, in an era before utter reliance on petroleum, San Francisco was a thriving cosmopolitan city of roughly 350,000 people that was able to feed itself mostly from the bounty of the surrounding countryside. While certain key factors have changed — most obviously the loss of farmland due to suburban sprawl

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— it seems reasonable that, with determined political energy, a similar system could be reestablished in the 21<sup>st</sup> century.

Successfully recreating a local food system will require diversifying agricultural land use to include more grain and humane meat production; encouraging farmers to adopt organic and sustainable methods; and improving transportation links from the farm fields to the urban center.

One way of encouraging a diversification in agricultural production is by protecting the region's endangered farmlands. There are roughly 10 million acres of land in the 25 counties that lie at least partially within a 100-mile radius of the Golden Gate Bridge. According to the Foodshed Assessment, only about half of that land is used for agriculture. One reason for this is the high real estate prices in the region. Every year, valuable croplands are lost to sprawling development; one out of seven acres of urban land in the foodshed study has been developed just since 1990. While Peak Oil will likely halt suburban sprawl and force a cutback in long-distance food shipping, it is still important that county and municipal governments take steps to protect agricultural lands. This could take the form of local governments encouraging farmers to put their lands into agricultural conservation easements and providing additional property tax rebates to growers. San Francisco's elected officials should use their influence with policymakers in nearby counties to promote such land use policies.

At the same time, San Francisco could help diversify regional food production by making a commitment to buying locally. The City should commit to buying as much locally grown food as possible for public institutions such as schools, hospitals, prisons, and government agencies. The City should also encourage private companies to purchase locally grown foods for their cafeterias, and to offer employees incentives for joining CSA programs.

But even a well-diversified regional food system will be dependent on fossil fuels. It's safe to assume that, even in the case of acute fuel shortages, agricultural production will be prioritized as an essential service — the tractors will keep running long after the casual trips to the shopping mall have been wrung out of the system. Nevertheless, it's important for growers to pursue measures to reduce their reliance on fossil fuels. One way of doing this is to adopt organic practices and break their dependence on chemical fertilizers. Another is to pursue low-till and no-till cultivation methods that will require fewer tractor hours. Improving irrigation efficiency is also important, as water pumping is the number one use of electricity in California.<sup>xlvii</sup>

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Local policy makers can promote a shift to sustainable agriculture by offering industrial growers a property tax rebate if they transition to organic methods, as Woodbury County, Iowa has done.<sup>xlviii</sup> San Francisco's elected officials should use their influence with their peers in other governments to encourage such innovative policies.

Perhaps the most important way to reduce the food system's reliance on petroleum and encourage diversified regional production is by strengthening farm-to-market distribution systems. Re-investing in medium distance food freight systems should be a top priority for San Francisco and Bay Area policy makers.

Much of the food that comes into the City arrives here via the San Francisco Wholesale Market and the South San Francisco Produce Terminal. An immediate priority should be rebuilding the rail networks that once linked these depots to the Peninsula and, by extension, to the rest of the state. The City should also pursue rebuilding the freight-handling capacity of the Embarcadero. Reconstructed barge and rail terminals along the waterfront would allow for the shipment of foodstuffs from the Sacramento Valley as well as from Napa and Sonoma counties via the Petaluma River. (For additional recommendations on freight handling, see the Transportation section of this report.)

By encouraging a rethinking of current agricultural practices in Northern California and reestablishing more efficient food distribution, San Francisco leaders can help ensure a steady food supply into the City.

#### *Create a Garden Within the City*

With its high population density, small land area, and cool, foggy climate, San Francisco is unlikely to ever be food self-sufficient. Nevertheless, there are huge opportunities for dramatically increasing food production within the City's 49 square miles.

By providing residents with the skills and the resources to start growing some of their own food, San Francisco could become a model of urban food production. This would, most obviously, bolster the City's own food security. Equally important, by demonstrating leadership on the issue, San Francisco's elected officials would be better placed to encourage policy makers in surrounding counties to rethink their current land use.

Historical precedents and contemporary examples from other countries show that there is great potential for San Francisco to boost its agricultural production.

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Perhaps the best-known example of urban food cultivation is the World War II Victory Garden program. In an effort to free up food for the soldiers (as well as to reduce the amount of fuel needed to transport food for civilians), the government encouraged citizens to grow some of their own fruits and vegetables. Some 20 million Americans answered the call, and by the end of the war nearly 40 percent of fruits and vegetables were coming from backyard or community gardens.<sup>xlix</sup> In San Francisco, part of the lawn in front of City Hall was converted into a vegetable garden, and there were more than 250 garden plots set up in Golden Gate Park.<sup>1</sup>

More recently, Havana, Cuba has shown that widespread, medium-scale urban farming can fulfill nearly all of a city's fruit and vegetable needs. In a kind of dress rehearsal for global Peak Oil, the island nation of Cuba has struggled with a collapse in petroleum availability when the Soviet Union dissolved, Cuba's access to oil dried up. Wracked with hunger, Cubans responded by creating urban gardens throughout the country. Today, Havana organically produces more than 80 percent of its fruits and vegetables.<sup>li</sup>

Unfortunately, the City and County of San Francisco is not doing as much as it can to follow these historical and international models and encourage residential food production. Currently, the City spends less than half a million dollars a year on food production programs and horticulture education.<sup>lii</sup> (This does not include programs paid for by the San Francisco Unified School District or the Community College District.) With a budget of more than \$1 billion, this accounts for a fraction of one percent.

The lack of public resources dedicated to local food production is disappointing when contrasted with the surprisingly large amount of land available in the City.

The SF Department of Public Works estimates that there are some 400 acres of public right of way suitable for conversion into public gardens.<sup>liii</sup> This does not include properties owned by the SFPUC, the SFUSD, or the Port Authority, which could include dozens of additional acres.

There are also hundreds of privately owned but vacant lots within the City that could be converted into productive food gardens. A survey done by Kevin Bayuk of the San Francisco Permaculture Guild and the Urban Alliance for Sustainability discovered 950 vacant lots covering 108 acres. This is likely a conservative estimate.<sup>liv</sup>

Additionally, private backyards are likely being underutilized. Amy Franchesini of Future Farmers and the San Francisco Victory Garden project, using

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block and lot numbers from the SF Planning Department, estimates that there are 1,887 acres of backyard space in City. While there is little way of knowing how these spaces are being used, it's safe to assume that only a small fraction are employed for home food cultivation.<sup>lv</sup>

Finally, there is the significant amount of space in the City's parks and public golf courses. In a densely built environment, these green areas provide a valuable recreational purpose. Nevertheless, some portion of these parklands and golf courses could be converted into food gardens, just as they were during the height of WWII.

If put into production, these vacant or underutilized lands would dwarf the acreage currently used by the City's 50 Community Gardens. Since there is, in fact, significant land that can be used for urban food cultivation, the question is: How can the City best take advantage of this surprising resource?

There are two main challenges to address: Making vacant and underutilized land available to residents; and funding programs that will give residents the technical skills and physical resources to grow some of their own food.

In an effort to address those challenges, a select group of City staffers and local community leaders involved in the San Francisco food system gathered at the Main Library on May 6, 2008 for a design charette to imagine how to dramatically boost food production with city limits.<sup>lvi</sup>

Currently, demand for gardening space is outstripping supply — most of the City's community gardens have long waiting lists, and when the Garden for the Environment announced its plans to install backyard vegetable gardens, its staff received nearly 200 applications for 15 available Victory Gardens.<sup>lvii</sup>

Participants at the design charrette suggested many possible ways of guaranteeing universal access to vegetable gardening spaces. Among other actions, the City should encourage residents to plant fruit trees along their sidewalks and facilitate the removal of curbside concrete to plant sidewalk gardens. To ensure that private backyards are fully utilized, the City could offer special property tax rebates and water discounts for residents who can demonstrate they are growing food. Similarly, the City should offer property owners special incentives to encourage them to allow gardeners to grow food on any vacant parcels. For property owners who have no plans to develop their parcels, the City should pursue creating special agricultural conservation easements. Additionally, the City could offer homeowners incentives for tearing down backyard fences and encouraging whole-block vegetable cultivation and composting, which would likely lead to greater harvests. Similar incentive plans for home water catchment, gray water systems, rooftop gardening,

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and beekeeping should also be considered. The City should also investigate the feasibility of “vertical farming”—using the sides of buildings to grow crops — and of organic hydroponics. The consensus at the gathering was that no open space should be allowed to go to waste: The highest and best use of unoccupied or underutilized land is to grow food on it.

But even if the City were to guarantee universal access to vegetable gardening spaces, many residents might not take advantage of the opportunity because they would not feel capable of growing their food. Having only experienced an industrial, centralized food system, three generations of people are ignorant of the basic principles of home food cultivation.

It’s crucial, then, that the City also provide resources to train people in basic horticultural skills. The City should dramatically expand funding for food production education programs (like those that currently take place at Garden for the Environment). At the same time, City departments should work closely with staff at SFUSD and CCSF to ensure that horticulture training is available to people of all ages and income levels. The City should consider creating a Bureau of Agriculture (housed within either SF Environment, RPD, or SFDPH) that would employ neighborhood horticulture extension agents to help train community gardeners. Part of the Bureau of Agriculture’s responsibilities could include organizing public education campaigns on food preservation and the ecological benefits of a less meat-heavy diet.

Aside from providing technical training, the City can also bolster local food production by providing essential gardening materials to residents (at reduced costs, depending on income). For example, the City should establish a city-wide materials depot where residents would be able to get quality organic compost, mulches, seeds and vegetable starts, and irrigation equipment. The City should also consider establishing a seed bank where community gardeners could buy, sell and trade seeds specially bred for San Francisco’s climate.

Participants at the design charrette had other innovative suggestions for City officials. For example, the City should rewrite the rules regarding small scale animal husbandry to allow residents to keep more chickens and rabbits than currently permitted, while also allowing residents to keep a small number of goats and hogs. The City should also reduce the number of miles that the municipal compost has to travel and create a plan for more neighborhood composting as well as vermicomposting (worm) systems. Another important opportunity for local food production is aquaculture, and it was suggested that the City should investigate what

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types of aquaculture may work along the Bay and Pacific shorelines. Remodeling the City's composting system and establishing an aquaculture fishery could become the responsibility of a newly created Bureau of Agriculture.

Finally, participants suggested that the City could help pay for these investments by placing a new tax/fee on sales of fast food items within San Francisco.

Even if the City were to aggressively pursue a local food production strategy, San Francisco will always be dependent on the surrounding counties for much of our caloric needs. But by growing some of our own fruits, vegetables, and eggs, the City can reduce the reliance on surrounding farmers and, crucially, free up acreage that can then be dedicated to grain production and livestock raising unsuitable for San Francisco.

### *Recommendations:*

The Peak Oil Preparedness Task Force recommends that the Board of Supervisors and City Department Heads take the following actions.

5. The City should implement a "Buy Local First" food purchasing policy as a way of bolstering regional food production. Public institutions such as San Francisco General Hospital, the County Jail, and Laguna Honda — as well as the SFUSD cafeterias — should seek to purchase regionally grown food whenever possible.
6. The City should create a Bureau of Agriculture that will empower residents to be their own food producers.
7. The City should undertake a comprehensive evaluation of public parklands, DPW right-of-ways, and PUC, Port Authority, and Housing Authority properties to determine what vacant parcels can be used for food cultivation. The Recreation and Park Department should study what portions of parklands and golf courses could be transitioned from recreational to food production uses.

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8. The City should investigate offering private property owners property tax rebates or water bill rebates for transitioning vacant or underutilized land to food production.
9. The City should dramatically expand its funding for food production education programs and work closely with SFUSD and CCSF to coordinate city-wide horticultural trainings.
10. The City should investigate instituting a tax on fast food sales to pay for local food production and education programs.
11. The City should create a materials depot (or multiple depots) where residents can access (at reduced cost, depending upon income) essential materials such as organic compost, and possibly seeds, vegetable starts, hand tools, and irrigation equipment.
12. The Department of Public Works should clarify its regulations regarding street tree planting and actively encourage residents to plant productive fruit and nut trees. DPW should also actively encourage residents to remove sidewalk concrete (while maintaining ADA corridors) and plant streetside gardens.
13. The Department of Public Health should rewrite the rules surrounding small-scale animal husbandry to allow for an increase in the number of chickens and rabbits that can be kept, while also allowing residents to keep a small number of goats and hogs.
14. San Francisco Department of Environment should develop a plan for reducing the number of miles the municipal compost travels and begin a program of block or neighborhood compost centers.
15. San Francisco Department of Environment should investigate the potential of innovative technologies such as water catchments systems, gray water systems, vertical farming, and local aquaculture to boost local food production.

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16. City officials should use their influence with elected officials in nearby counties to encourage new incentives — such as agricultural conservation easements — to protect farmland. City officials should also encourage their peers to promote a transition to more diverse and sustainable farming methods by offering property tax rebates to farmers switching to more ecologically sound practices.

17. The City should begin studying how to re-establish rail and barge freight lines into San Francisco.

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### 6. Transportation Evaluation

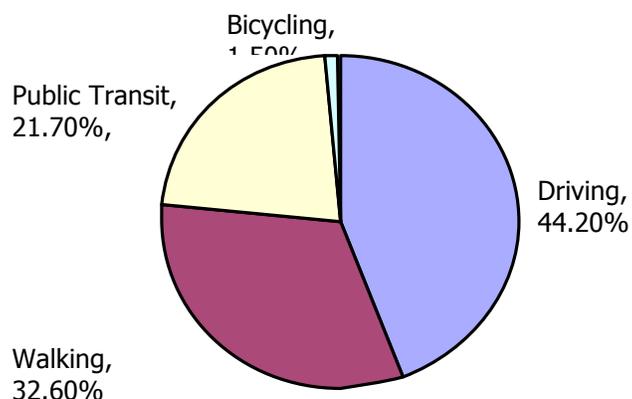
As it is in every city in the world, the transportation system into, out of, and around San Francisco is used by literally every resident and visitor in order to work, go shopping, attend school, visit friends, engage in cultural events, or take part in any activity that brings people out their front doors.

San Francisco is already far ahead of other U.S. cities in establishing a transportation system that will be resilient in low-energy conditions. San Francisco not only has made substantial investments in energy-efficient modes of transportation, but has for decades operated on policies that make walking, bicycling, and public transit all critical planning priorities. This important emphasis on transit, along with the natural, sprawl-inhibiting boundaries of the city, have helped the city develop an efficient transportation system through most of San Francisco.

The four main ways people get around San Francisco are **driving** (44.2% of trips), **walking** (32.6%), **public transit** (21.7%), and **bicycling** (1.5%).<sup>lviii</sup>

As is typical of dense urban environments, San Francisco has relatively low **automobile use**: while the average American household has 2.28 cars,<sup>lix</sup> San Francisco averages 1.1 cars per household.<sup>lx</sup> San Francisco policies have been built around resisting growth in auto use, and voters have supported such policies: most recently, in 2007, voters soundly defeated Measure H,

#### Popularity of Transportation Modes in San Francisco



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which would have dramatically increased the amount of parking developers would be able to construct throughout the City. Even with such *relatively* low auto figures and resistance to its expansion, auto travel is still the most common means of travel in the City. In 2006, 44.2% of trips within San Francisco were made in an automobile. Inter-county auto use is substantially higher, with around 80% of round trips *into* the city, and 90% of round trips into the surrounding counties, taken in an automobile.<sup>1</sup>

The vast majority of private automobiles operated in San Francisco are conventional, gasoline-only, non-hybrid vehicles. San Francisco's purchase of hybrid vehicles is substantially higher than the national average, but fewer than 0.48% of cars in the San Francisco metro area are hybrids (a figure higher than every metro area in the country except for Portland).

**Walking** is the second-most popular way to get around San Francisco. Though only 9.4% of San Francisco residents walk to work, nearly a third of all trips taken in the City are on foot, meaning a substantial number of San Francisco residents walk for recreational or other non-work purposes. San Francisco's high density and Mediterranean climate make walking a good way of getting around for short trips for most of the year, San Francisco's famous hills notwithstanding.

San Francisco benefits from pedestrian advocacy organizations such as Walk San Francisco which fight for pedestrian rights and amenities, and the City government is very responsive: in February of 2006, the Board of Supervisors adopted a "Better Streets Policy," establishing as official policy that urban planning in the City use "best practices in... pedestrian-oriented, multi-modal street design," and requiring that pedestrians, along with public transit, be given "particular emphasis" in transportation-corridor planning.<sup>2</sup> This has resulted in the development of a Better Streets Plan, now under development by the Office of the Mayor, which aims to "create a truly great pedestrian realm in San Francisco."<sup>3</sup> Throughout the planning process, over 500 San Francisco residents participated and gave feedback on the Plan.

After driving and walking, **public transit** is the most common way that San Francisco residents get around. Currently, 21.7% of trips taken in the City are on public transit. San Francisco's public transit system is generally efficient from an energy standpoint, and service is widespread.

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<sup>1</sup> MTC Travel Forecasts for the San Francisco Bay Area 2009 Regional Transportation Plan, Vision 2035 Analysis Data Summaries, Table E.

<sup>2</sup> San Francisco City Ordinance 33-06: Better Streets Plan, File No. 051715, February 6, 2006. [http://www.sfgov.org/site/uploadedfiles/planning/Citywide/Better\\_Streets/better\\_streets\\_policy\\_or\\_dinance.pdf](http://www.sfgov.org/site/uploadedfiles/planning/Citywide/Better_Streets/better_streets_policy_or_dinance.pdf)

<sup>3</sup> Better Streets Plan (DRAFT), June 2008, p. 5.

[http://www.sfgov.org/site/uploadedfiles/planning/Citywide/Better\\_Streets/Draft\\_BSP\\_Executive\\_Summary.pdf](http://www.sfgov.org/site/uploadedfiles/planning/Citywide/Better_Streets/Draft_BSP_Executive_Summary.pdf)

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The main provider of public transit in San Francisco is the San Francisco Municipal Railway (Muni). In the past decade, Muni has provided between 208 million and 235 million rides per year on its light rail vehicles (20% of public transit ridership), buses (electric, 33%, and diesel, 43%), and cable cars (4%).<sup>lxi</sup> San Francisco forecasts an increase in its ridership based on projections by the Association of Bay Area Governments that project San Francisco's population to grow by 19.5% in the next 35 years.<sup>lxii</sup>

In a bid to reach clean-air goals, Muni has begun incrementally converting its fleet to hybrid engines, and then eventually to purely electric engines powered by hydrogen fuel cells. While that conversion takes place, every diesel-powered vehicle in the fleet now uses 20% biofuel.<sup>lxiii</sup>

While Muni is the main provider of public transit within the San Francisco, a number of other regional transit providers connect to the City from throughout the region as well. San Francisco is working on a Transbay Transit Terminal that will effectively connect most of these different transit services in a single facility. The five-story, 900,000-square-foot facility is expected to serve around 45 million passengers per year, eventually serving AC Transit, Amtrak bus service, BART, Caltrain, Golden Gate Transit, Greyhound, high-speed rail, Muni bus lines, and SamTrans.

In 2007, Muni projected twenty-year capital-cost expenses of \$20.1 billion; however, only \$11.1 billion in revenue is currently projected over that time period, leaving a \$9 billion shortfall.<sup>lxiv</sup>

Finally, **bicycling** represents 1.5% of trips that start and end within San Francisco. Requiring no fuel and able to make use of roads yet also be brought onto public transit, bicycles are versatile and efficient. With simple modifications such as headlights, reflectors, and panniers, bicycles can be made suitable for a number of trip purposes, including commuting, shopping, and travel to and from social and cultural events. Cycling is effectively as energy-efficient as walking, but has a comfortable travel range far greater than does getting around on foot.

San Francisco is a bicycle-friendly city in a number of ways. As with walking, while its hilly topography does present some challenges, the relatively small size and year-round mild climate of the City allow residents to use bicycles at any time and to reach most points of San Francisco. Cycling is also a very visible part of San Francisco's culture: for instance, the San Francisco Bicycle Coalition now claims over 10,000 members, and on the most recent Bike to Work Day, Market Street had more bicycle traffic than car traffic during peak commute hours.

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### **Vulnerabilities**

In general, San Francisco is better prepared than most American cities to cope with an environment of scarce and expensive fossil fuels. However, the City still has a number of vulnerabilities in its transportation system that should be addressed. 45% of energy used in San Francisco is consumed in the form of vehicle fuel.

The greatest vulnerability San Francisco faces is its reliance on automobiles. The substantial majority of privately operated vehicles rely on gasoline and oil, as do a non-negligible portion of city-owned and public-transit vehicles. Already, automobiles are the most expensive and least sustainable method of transportation available to San Francisco residents and visitors; AAA of California estimates that it costs an average of \$7,000 per year to own, operate, insure, fuel, and maintain an automobile. In a post-Peak environment of high fuel prices and a weakened economy, such costs can only be expected to rise substantially.

Conventional autos (those consuming petroleum-based fuels and without a hybrid engine) consume the most gasoline per mile of any auto, and are therefore the most vulnerable to fuel price shocks. They are also by far the most common vehicle type on the road today, a condition unlikely to change soon. The median age of automobiles in America today is nine years; assuming this holds, even if starting tomorrow every new vehicle sold in America were a hybrid or electric car, by 2018, half of the autos on the road would still use conventional, non-hybrid, gasoline engines.

But the rate of replacement of conventional autos by hybrids is nowhere near 100%. During the first ten months of 2008, 2.4% of new autos sold in the U.S. were hybrid vehicles; of those, 15% were SUV or luxury vehicles that achieve less than 30 mpg in city driving. As previously mentioned, less than one-half of one percent of cars in the San Francisco Bay Area are hybrids. And hybrids still need fossil fuels or fossil-fuel substitutes, albeit less. Hybrids are not being developed fast enough and are still not fuel-efficient enough to make a substantial difference on their own in reducing domestic oil consumption.

There are alternatives to the conventional auto, which do not use petroleum at all. One such automobile type is the plug-in electric car. However, there are significant infrastructure challenges in bringing electric vehicle use to any meaningful scale. Electric vehicles require hours to fully charge, which eliminates the possibility of establishing charging stations that, like gas stations, could quickly recharge the vehicles. There is some effort to work around this limitation; the Better Place Project, for instance, is working on a method where electric car users could swap depleted batteries for ones that had already been charged, but this effort is still in the experimental stages and is not ready for wide use.

Even if the City were willing to spend the tremendous amount necessary to build and maintain citywide electric-car-charging infrastructure, San Francisco does not have access to the significant

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electrical power that would be necessary to charge more than a fraction of the vehicles on the road: a recent study estimates that, given current capacity, California would be unable to handle a conversion of more than 15% of the current automobile stock to electric vehicles.<sup>lxv</sup>

Automobiles will be affected more than any other transportation option by Peak Oil, but no mode of transportation used in the City will go unaffected: a shift away from automobile use, the most common mode of transportation, would dramatically increase the number of people using other means to get around. Those likely to be first and hardest impacted by forced mode shift are populations already on the margins who will find themselves unable to keep up with spiking fuel prices. However, very quickly, members of all economic strata in San Francisco will feel the impacts of the low-energy environment that will be imposed upon the City. While there is substantial capacity in the existing networks for increases in bicycle and pedestrian use, public transportation networks will likely struggle to cope with increased passenger loads. The system already suffers from overcrowding on a number of lines, and gas-price-induced ridership spikes in 2008 demonstrated that San Francisco can expect to see tremendous increases in passenger volume when fuel prices rise again.

Bicycles are another alternative to autos that are underdeveloped and face a number of hurdles. Only 1.5% of trips within the city are via bicycle, and while an increase in gasoline prices will likely increase bicycle use, the barriers that currently prevent people from using this mode will still be in place: cycling seems dangerous, adequately securing a bicycle and its accessories is difficult or impossible, and use of a bicycle requires ownership, as there exists no bicycle-sharing program in San Francisco (though such systems are currently being pursued by the City).

Similar to the vulnerability of automobiles, air travel will suffer substantial price shocks as jet fuel, a petroleum derivative, becomes more expensive. Such an effect was already demonstrated during 2007 and 2008, when the increase in the price of oil caused sharp increases in plane fare, and drove several airlines into bankruptcy. (Because of the direct connection to the broader economy at large, air travel is covered in greater depth in the Economy section of this report.)

However, more troubling than the insufficiency of any given mode of transportation is that the people of San Francisco are largely unaware of the details of Peak Oil, and do not know how important it is to transition away from heavy use of fossil fuel. The residents of San Francisco cannot accept and adapt to the possible ramifications of post-Peak conditions if they are unaware of the gravity and timeline of the situation. Residents must understand that reduced fossil fuel use will be a permanent change, and not simply a market fluctuation, in order to make necessary adjustments to preferred modes of transportation.

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### **Goals and Strategies**

The purpose of San Francisco's transportation network is to give San Francisco residents the ability to travel in, out of, and around the City, maximizing flexibility and convenience. Peak Oil will not change this. What *will* change are the conditions under which this network must operate. All of the Peak Oil preparedness goals are intended to maintain the primary purpose of the system while reducing the petroleum demand of the City, and increasing the flexibility of the various modes available.

In order to avoid the worst impacts of Peak Oil, the City of San Francisco must make long-term sustainable investments in transportation that can affordably be operated in a low-fuel environment. It is critical that decision-makers understand there is no single policy that will ameliorate Peak Oil conditions. No single alternative vehicle or form or renewable power generation, or any other one idea, will fully or mostly achieve Peak Oil readiness. San Francisco must cast a wide net, with an eye not only on giving residents alternatives to the automobile, but also on a range of smart zoning, planning, parking, and development policies that allow and encourage low fossil-fuel consumption: mixed use, walkable, bikeable neighborhoods built around reliable transit lines and hubs.

The following are a number of goals and critical strategies San Francisco should use when shaping policies to prepare for Peak Oil conditions. The list is by no means exhaustive, but represents the first, broad approaches the City should consider in its planning. The inclusion of strategies on this list is also not meant to imply that the City is currently not pursuing them in some capacity (often in pursuit of goals unrelated to Peak Oil, such as congestion management, pollution reduction, and increasing quality of life). It is the finding of the Peak Oil Preparedness Task Force that, regardless of the current status of these programs, they should be prioritized and aggressively expanded.

**Goal: Reduce Auto Use Within the City.** Reducing automobile use should be the primary goal of Peak Oil preparedness policies and programs. There are a number of metrics used to measure auto use in San Francisco; the City should aspire to reduce all of them, including auto ownership, total vehicle miles traveled (VMT), VMT per passenger, peak congestion levels, and others. Reductions in any of these metrics demonstrate movement toward increased Peak Oil preparedness.

- **Be Proactive.**

If and when gasoline prices sharply rise and supplies become unreliable, mode shift will occur regardless of whether San Francisco plans for it or not. San Francisco should not be merely reactive to an increased demand for non-auto transportation. On the contrary, the City should actively *induce* shifts away from automobile use toward more efficient and sustainable alternatives as vigorously and as soon as possible. Encouraging a shift away from autos now, before conditions worsen, will help ease the challenges San Francisco

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residents may face later. This is in part because, if populations that would shift suddenly away from car use can be induced instead to gradually make that shift, the transportation system will have time to grow and adapt where necessary instead of being victim to explosive ridership growth. The City, too, will have lighter infrastructural burdens if the number of automobiles on the road is decreased, lowering maintenance costs and liberating funds.

- **Make Driving Less Appealing.**

Inducing a shift away from auto use can be accomplished by enacting policies that make public transit, walking, and bicycling truly competitive with the automobile. The most direct method is to make driving less economical, starting by making drivers pay the full price for services they currently receive for free, or at a significant discount. For instance, city-owned metered parking spaces could charge true market rates (i.e., comparable garage prices), and cars driving downtown during rush hour could be charged a congestion fee. Neighborhood parking permits could also use an increase in price. Even in comparison with other *publicly owned* spaces, neighborhood parking permits are extremely inexpensive. Where neighborhood parking permits cost \$74 per year, long-term parking at any BART parking lot (far less in demand than parking in many San Francisco neighborhoods) costs \$5 *a day*. A San Francisco neighborhood parking permit costs 1/24<sup>th</sup> of what BART parking costs in a year, and less than one seventh of the cost of buying a year of Muni permits.

- **Reduce *All* Automobile Use, Not Just Conventional Autos.**

There are alternatives to the conventional automobile that use less petroleum (hybrids), or none at all (plug-in electric, fuel cell, and alternative fuel autos), and it is tempting to believe that, because these alternatives would be similar to current transportation patterns, the City should focus on encouraging residents to switch from one sort of auto to other more sustainable types.

This would be a mistake, and would send a mixed message. Hybrid vehicles lessen but do not eliminate a need for fossil fuels. Even those hybrids that manage to get 50-60 miles per gallon will be costly to fuel if the price of gasoline rises to \$8, \$10, or \$15 per gallon (or beyond). Meanwhile, stunted by a low theoretical ceiling as to the number of vehicles the City could charge, the electric car should not be seen as a viable replacement for a significant number of cars in San Francisco. Remember that the theoretical maximum of electric vehicles that the grid in California can charge at night is only 15% of the current fleet. The realistic maximum is even lower; furthermore, the grid will be under additional pressure due to falling natural gas supplies and rising demand as applications other than transportation switch from fossil fuels to electricity.

The best option for San Francisco is not to encourage its residents to switch from one type of car to another, but to move away from auto use altogether. Those for whom owning a

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hybrid, electric, or alternative-fuel vehicle is economically sound will be able to assess their own finances, buy the best vehicle for their situation, bear the costs, and enjoy the benefits of their decision without any City intervention. Meanwhile, San Francisco should focus on making the City functional without cars, as residents will increasingly choose modes of transportation other than private auto use.

- **Use Car-Sharing Programs to Reduce Car Dependency.**

Counter-intuitively, one effective method of reducing car ownership is increasing their availability. Car-sharing programs can allow those who would prefer not to own a car but require one for occasional trips to make that transition. Especially while fuel prices are relatively low, there is little financial disincentive for car owners to use their vehicle as their primary means of travel. The majority of car ownership costs—car payment, insurance, registration, a parking space—remain largely the same regardless of how much the car is driven. But if the costs of using a car are entirely on a trip-by-trip basis, as they are with car-sharing programs, there is much greater incentive to consider other travel options. Thus, those who are able to shift from private car ownership to relying on car-sharing programs can not only save money, but are more likely to choose ways to get around other than by car. San Francisco should encourage these programs, especially targeting those neighborhoods where the availability of such vehicles is most likely to convince residents to get rid of their cars.

Car-sharing programs make excellent candidates for electric car use. San Francisco should explore working with car-sharing organizations to install the infrastructure necessary for cars to be charged at their designated spots. This would make shared vehicles far more energy efficient and less dependent on oil and gas (though 40% of electricity used in San Francisco does come from natural gas), allowing car-sharing organizations to avoid high fuel costs should prices again substantially rise.

- **Educate the Public About the Need for Energy-Efficient Transportation.**

It is vital that San Francisco residents understand that, in the relatively near future, the price of oil and gasoline may be significantly higher, and far more volatile. Educated constituents are more likely to support the mitigation efforts undertaken by the City government, and are also more likely to take vital actions themselves, such as establishing lifestyle patterns that minimize the need for car use, or eliminate that need altogether. Teaching the residents of San Francisco what they should expect, and how it is likely to affect their travel habits, will be as effective as any subsidy, incentive, driving fee, or transportation improvement program.

- **Convert the City Fleet Away From Fossil Fuels to Electric and Human Power.**

The City should move to convert its vehicle fleet to maximize fuel efficiency in the short term, and in the long term, to energy sources that do not require fossil fuel inputs. There is also a city bicycle-sharing program that City employees can use instead of using City

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vehicles. San Francisco should ambitiously expand these efforts. All vehicles in the City fleet should be subject to similar goals, finding ways to reduce or eliminate petroleum consumption by maximizing efficiency. Not only is this helpful in achieving Peak Oil preparedness, but such moves will help the City achieve its environmental aims as well, helping to reduce pollution levels across the City.

**Goal: Build A World-Class Transportation System that Does Not Rely on Autos or Auto-Related Revenue Streams.** Higher gasoline prices will drive visitors and residents away from auto use; in turn, fewer people driving around the city means that San Francisco can expect an increase in public transit ridership, bicycle use, and pedestrian activity. In particular, San Francisco should focus on making the public transit system more robust, striving to make the system directly competitive with the automobile in areas of cost, reliability, and trip comfort. Revenues from automobile sources, meanwhile, can be expected to decline as people shift away from car use. This includes gas tax and parking meter revenue, as well as revenue streams from State and Federal sources that San Francisco currently relies on. San Francisco should thus have as a goal not only a world-class public transportation system, but one that will maintain funding security even when car use declines.

- **Make Public Transit More Appealing.**

Any realistic, post-Peak transportation scenario must have a robust public transit network as its backbone. While private auto use will continue for at least some time to be a dominant mode of travel, and walking and bicycling will serve residents traveling inside their own neighborhoods or those nearby, it is public transportation that will make it possible to travel from one end of San Francisco to another, or out of the city entirely, without being dependent on owning a car. As oil prices rose through 2008, transit ridership spiked. This will occur again, likely even more acutely, when oil prices go up again.

San Francisco must invest heavily in making public transit not simply available, but truly *competitive*. There are a number of worthwhile programs in place to accomplish this goal, including the Central Subway project that will expand MUNI Metro service north to Chinatown and beyond, and the installation of Bus Rapid Transit corridors along Geary and elsewhere. Increasing area and speed of service are both excellent steps in the correct direction. Currently, travel speed is an area in which Muni could use some improvement: on average, city buses and trains travel only eight miles per hour (and slower than 5 mph on downtown streets).<sup>4</sup>

**Electrify MUNI, using Hetch-Hetchy power as much as possible.** As part of its Clean Air Plan, Muni plans to gradually replace older diesel buses with hybrid-electric buses, moving by 2020 to a zero-emissions fleet composed of fuel-cell, electric-drive vehicles. This is not a good long range plan from a Peak Oil and Gas perspective. Assuming that hydrogen fuel cell buses are commercially viable in time for this transition, they are utterly dependent upon natural gas to produce the hydrogen. Overall, they are intrinsically much more expensive and less fuel-efficient than trolley buses. Moreover, the electricity for the trolley system comes from the city-owned Hetch-Hetchy hydroelectric

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<sup>4</sup> “Muni on the rise,” Dave Snyder, *The Urbanist*, February 2008.  
[http://www.spur.org/documents/020608\\_article\\_01.shtm](http://www.spur.org/documents/020608_article_01.shtm)

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plant. It is cheap, stable, and not at all linked to fossil fuels. MUNI already has in place a Trolley Expansion Plan to extend trolley lines to the underserved southeast areas of the city. It is past time to implement this plan.

- **Accurately Plan for the Future.**

Of course, in order to get ready for looming transportation mode shifts, San Francisco has to accurately predict what that shift is going to be. Current regional planning forecasts do not take the effects of expensive gasoline into account, and predict a slight growth in car use in the next 25 years. Yet through 2007 and 2008, across the country, gas prices over \$4 per gallon caused millions to opt to use public transit instead of automobiles. Gas prices are likely not only to increase, but to become increasingly volatile as rising oil prices cause a reduction in oil demand, which in turn causes a sudden drop in oil prices. San Francisco must integrate the mode shift effects of potentially unprecedented gas prices and price volatility into forecasts – and must calculate the expected reduction in revenue that a drop in bridge fares, parking meters, and other car-generated revenue streams would cause.

- **Relieve Pressure on the System Through Smart Land-Use Planning.**

One of the best methods of easing the burden on San Francisco's transportation system is to minimize the necessity of its use. Clearly, San Francisco should continue to provide comprehensive, robust transportation options to its residents and visitors, but if individuals are able to find what they need in their neighborhoods – jobs, groceries, places of social and cultural value – then they will not need to rely on public transit or take a spot in traffic. Thus, neighborhood-friendly zoning that allows mixed use and encourages transit-oriented development not only increases the social cohesion of San Francisco's neighborhoods, but makes them more transportation-efficient as well. San Francisco should also encourage telecommuting to allow residents who are able to eliminate their commute entirely.

**Goal: Make Bicycling Seem – And Be – Safer, Easier, and More Secure.**

Bicycles have a tremendous amount of promise as a sustainable mode of transportation that could replace at least some car trips for nearly all San Francisco residents. It is likely that interest in non-recreational cycling will increase as gasoline costs push people into exploring other options, but greater bicycle use will only take hold if barriers to cycling are actively addressed and eliminated. Because one of the major goals of Peak Oil preparedness is to shift San Francisco residents away from private auto use, it makes sense to aim at making bicycle use directly competitive with car use. To increase bicycle use, San Francisco must increase road safety, bicycle security, and bicycle access.

- **Make the Roads Safe for Cyclists.** First, on the issue of road safety: San Francisco must strive to make its residents feel safe using bicycles on city streets to get to points of interest both within and beyond their respective neighborhoods. This means establishing well-marked bicycle lane networks that feature prominent lane striping, or even physical

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barriers to keep cyclists safely separated from auto traffic. The cars are not the only peril cyclists have to worry about: repairing pot holes and other damaged road surfaces where they appear in bicycle lanes has to be a critical priority. And cyclists have road safety responsibilities as well. The City, potentially in partnership with the San Francisco and Bay Area Bicycle Coalitions, should make it a priority to educate cyclists on how City laws and ordinances apply to them.

- **Increase Bicycle Security.** Cyclists must also feel confident that their bicycles are safe when they have locked them up. The threat of thieves stealing bicycles or bicycle parts is very high in San Francisco; in 2008, San Francisco ranked #4 on Kryptonite Locks' top-ten list of the worst cities in the country for bicycle theft. And, of course, the more expensive a bicycle is, the more worried its owner will be about its theft, and the more prize a target it is for thieves. This means that, ironically, the more one has invested in one's bicycle, the more worried that individual may be about actually using it on city streets. While there are currently bicycle *racks* in various parts of the city, San Francisco should consider widespread bicycle *locker* installations, so that city cyclists can feel safe leaving their bicycles for hours at a time without concern that pieces will be stolen, or that they will be left completely exposed to the elements. To make cycling competitive with auto use, San Francisco should consider partnering with auto garages to install bicycle lockers on their premises, potentially paid for with a Citywide, fee-based cyclist membership system.
- **Promote Bicycle Sharing.** San Francisco residents must have access to bicycles in order to use them. Residents of San Francisco are able to live lifestyles largely free of auto use if they so choose while still paying to use a car occasionally through flexible car-rental programs such as ZipCar and City CarShare. Drivers can rent any of a range of vehicles suited for different activities, use them for a few hours or for days, and return them to convenient, reserved on-street parking spaces. Currently, no such program exists in San Francisco for bicycles, however. San Francisco should pursue bicycle-sharing programs; nascent programs in Paris and Washington, D.C. can serve as excellent models.
- **Promote Car-Free Lifestyles With Temporary and Permanent Pedestrian, Bicycle, and Transit Rights of Way.**  
The City should support and encourage car-free living by generously designating rights of way to pedestrians, cyclists, and public transit. This includes installing and maintaining wide pleasant sidewalks; creating a thorough network of bicycle lanes kept in good repair; designating transit-only traffic lanes; and closing targeted streets, on temporary or permanent bases, to auto traffic. The City has been engaging in this last tactic on weekends in Golden Gate Park and also on the Embarcadero; the City should ambitiously expand this program to other streets that could benefit from such traffic holidays.

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Obviously, San Francisco must do everything it can to prepare its own local transportation networks. But San Francisco does not exist in isolation. Indeed, San Francisco thrives because it lies at the heart of a productive metropolitan area in a powerful and affluent state. The Bay Area, the State of California, and the country as a whole will likely succeed or fail together. To that end, the City must do what it can to take advocate for smart transportation policies both within and beyond its borders.

#### ▪ **Support Regional Transit**

Most directly, this means supporting regional transportation systems already in place, such as BART, CalTrain, and Golden Gate Transit. And, indeed, San Francisco has taken clear steps to support the growth of these systems. The most significant investment is the new TransBay Terminal, currently in the early stages of development, which will tie together all of San Francisco's local and regional transportation services in one facility, including California's high-speed rail service, scheduled to be brought online in the next 15 years. Regional transportation strategies should include not only expanding capacity and reach of regional facilities, but also interoperability and ease of use. For example, San Francisco should do all it can to encourage making it a regional priority to bring the TransLink fare card system completely online. San Francisco should also continue to advocate for the expansion of the railway tunnel, and for the electrification of CalTrain.

#### ▪ **Fight for State, Federal Funding**

San Francisco should use those avenues it has available to advocate on State and Federal levels to fund projects that will reduce dependency on oil. Ideally, this would result not merely in particular Bay Area projects being funded, but in the development of statewide and national programs that will increase walking, bicycling, and public transit use, and decrease private auto use. Individuals are more likely to support funding for programs that have been successfully implemented in their area. Thus, programs implemented anywhere in the country that encourage alternatives to the single-occupant automobile are a victory for San Francisco, because such successes make it easier for elected representatives to support further expansion of such programs.

#### ▪ **Work With Allies**

San Francisco need not act alone in advocating such changes, and indeed, the primary mission of the City is self-governance, not outward-facing advocacy. For this reason, San Francisco provide whatever support it can to those organizations already fighting for these causes. Organizations advocating throughout the Bay Area include TransForm, the Bay Area Bicycle Coalition, and Greenbelt Alliance, among numerous others. Nationally, San Francisco should support the efforts of the American Public Transportation Association, Transportation for America, the U.S. Public Interest Research Group, the Congress for the New Urbanism.

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### **Recommendations**

Pursuing the following policies will help best prepare the San Francisco transportation network for an energy constrained environment:

- A. Make driving less appealing by, among other methods, reinternalizing costs that have been externalized (parking, congestion).
- B. Encourage and expand car-sharing programs, prioritizing the use of electric cars especially.
- C. Annually evaluate fuel efficiency across all City Departments, setting reduction goals and designating a portion of each Department budget toward that end.
- D. Make public transportation a more affordable, convenient, direct, and reliable method of travel than the private automobile through continual expansion and implementation of such projects as bus rapid transit and the Central Subway.
- E. Integrate gas prices of unprecedented magnitude in long-range planning forecasts and models.
- F. Ease the burden on the transportation system by encouraging mixed-use neighborhoods, telecommuting, and other policies that encourage travel reduction.
- G. Encourage bicycle use by making cycling safer, assuring bicycles are easy to secure, and providing bicycle availability through implementing a bicycle-sharing program.
- H. Encourage car-free lifestyles by providing generous sidewalks, integrated bicycle networks, and entire streets that are (temporarily or permanently) closed to car traffic.
- I. Support the regional mass transit networks both during regional policymaking opportunities and by providing infrastructural support in the City.
- J. Work to secure funding from State and Federal sources for infrastructure expansion and maintenance.
- K. Establish and use relationships with natural allies on transportation issues, including like-minded neighboring jurisdictions and non-profit organizations.

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### **End Notes**

## **6B) TRANSPORTATION - FREIGHT**

### **6B.1 Assessment of Current Situation**

According to the 2002 Commodity Flow Survey<sup>1</sup>, 40% of U.S. domestic ton-miles were shipped by truck, 40% by rail, 9% by water, and 0.2% by air. These figures are misleading, however, since 44% of rail tonnage is the shipment of coal. Other than coal, trucking dominates cargo hauling in the US.<sup>2</sup>

Waterborne transport is about 20% more energy efficient than railroad transport, which in turn is about eleven *times* more energy efficient per ton than truck transport<sup>3</sup>. There is some dispute as to the exact efficiency difference between water and truck transport, but it is certainly an order of magnitude. Energy has been so cheap that trucking's flexibility has been more valuable despite its far higher energy cost. Truck transport trips are shorter on average than rail or water trips, and its cargo less dense.

San Francisco is marooned at the end of a peninsula, with virtually all cargo arriving by truck. Even air freight is trucked up from the airport. The one exception is the import of bulk aggregate (gravel) by barge to pier 80. Nearly all material exports also leave by truck.

**WATER TRANSPORT; PORT OF SAN FRANCISCO:** The Port of San Francisco consists of "finger piers" and other industrial piers, which are not well suited for intermodal (container) shipping. Today, there are 39 piers remaining. Between the gradual de-industrialization of the city and the rise of containerized cargo, the industrial potential of the port of San Francisco has long been neglected, and many, though not all, of these piers are in disrepair. Oakland is in a better geographic position to handle multi-modal freight, but there is a strong possibility that short-haul coastal and river shipping will increase significantly in volume, reviving the fortunes of the Port of San Francisco.

Certain piers especially deserve a closer look. Pier 80, the breakbulk (pallet) cargo terminal, has tremendous potential. It is a deep water pier with on-dock rail access, as well as home to a complex of historic Victorian-era brick industrial structures. The Pier 90 complex houses the city's recycling facility and some freight handling, but could be used for much more.

**RAIL TRANSPORT:** In common with many other cities and towns, San Francisco has drastically curtailed its freight rail capacity. The only remaining freight rail line into the city comes up the peninsula, sharing track with Caltrain, before turning east toward piers 80 and 90-96. It runs through a tunnel that is too low for modern freight rail operations. When Caltrain electrifies its trains, the electric lines will be overhead, making the problem even worse.

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**AIR TRANSPORT:** Air freight arrives at both San Francisco International Airport (SFO) and Oakland Airport, in approximately equal volume.<sup>4</sup> However, SFO handles 93.2% of the international cargo. Cargo processed through SFO is more valuable, totaling \$63.8 billion in value, and ranking San Francisco fourth in the U.S. At SFO, 57 airlines handle cargo in 989,000 square feet of office and warehouse space. Seventeen of these are cargo-only airlines.

Package shippers such as United Parcel Service (UPS) and Federal Express (FedEx) are a vital part of San Francisco's economy. Currently, they ship by air and truck. In the financial district, bicycle carriers dominate courier services due to traffic congestion and a dearth of parking.

#### **6B.2 Vulnerabilities**

Freight hauling will certainly be profoundly impacted by rising fuel prices. For long distance air or water shipping, liquid fuels will be very difficult to replace as the source of power. Because of the fuel efficiency of rail and water transportation, we can expect a mode shift in the transportation of goods. Air freight will decline in importance, while rail will gain market share. Short sea shipping will likely make a comeback. Already the U.S. Maritime Administration is sponsoring a public-private cooperative venture to promote a coastal marine highway connecting Oregon and California. As a major manufacturing center, Los Angeles is another likely node in a network of coastal shipping routes. In the future, food is another likely product for shipping to the Bay Area by water.

Within the U.S., it will be very, very difficult to move away from trucks, because our entire infrastructure is focused on roads for moving most goods. Though energy efficiency will become much more important, it will be difficult, if not impossible, to move a significant portion of freight from truck to rail. One rail analyst asserts that the nation's 140,000 miles of rails are so congested they cannot handle even an increase of 25%.<sup>5</sup> Major investment will be needed to keep America's rail system functional, not to mention efficient.

In contrast to our counterparts in Europe and Japan, the United States has failed to update its rail system. Europe and Japan have not only invested in rail, but in *electric* trains, even for cargo, giving them fuel flexibility. Europe also has an extensive system of river and canal cargo routes. In contrast, the U.S. transportation system is based on diesel trucks, diesel trains, and kerosene airplane fuel. The American economy will be at an ever greater competitive disadvantage as fuel prices increase.

San Francisco's exports are primarily services, but even producing these requires substantial cargo hauling. Package delivery is particularly vital. In addition, San Francisco residents require food and other products. Rail access is limited by the inadequate size of the current tunnel, which forms a choke point against expanded freight rail. The City urgently needs to develop freight access other than by truck, or it will find itself at an economic disadvantage compared to other cities that have alternative cargo infrastructure.

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Like air travel, air freight faces a gloomy future. Even now, only high-value cargo merits air transport. Imagine fuel at triple current cost and more; most of today's air cargo will no longer be economical.

#### **6B.3 Goals and Strategies**

##### **6B.3.1 Develop alternatives to hauling freight by truck.**

**PORT OF SAN FRANCISCO:** There is a great opportunity for San Francisco in the coming rise in shorter distance water shipping. It is vital that the City preserve and renovate its available piers, particularly Piers 70-96, in order to exploit this potential competitive advantage. The Pier 90 complex presents the Port with an exceptional opportunity, for it has considerable open space and, like Pier 80, is accessible by rail. Should Federal infrastructure funding become available, the port upgrade is ideal for submission. It needs to be a priority.

**FREIGHT RAIL:** A modern city needs modern freight rail access. San Francisco must build up its rail capacity, starting with the Caltrain tunnel. Fixing it is the first step toward a functional freight rail system, as well as a big step toward revitalizing our maritime industry. This is another project ideally suited for using Federal infrastructure funds.

Beyond the enlargement of the tunnel, San Francisco needs to formulate a plan to revitalize rail access to the city. When oil and gas become prohibitively expensive, electric rail will be the major cargo transport mode. Cities and regions with well-developed rail will be at a competitive advantage, but such development takes time and must be commenced immediately.

**BICYCLE AND NEIGHBORHOOD ELECTRIC VEHICLES:** San Francisco's compact geography and mild climate could work to its advantage with respect to delivery of smaller items. Package shippers such as United Parcel Service (UPS) could deliver by bicycle or electric shuttle from neighborhood distribution centers. Already, UPS is experimenting with bicycle delivery in Portland. San Francisco is even better suited to delivery bicycles, and has bicycle couriers already.

**ELECTRIC TROLLEY TRUCKS:** Trucks that run on overhead electric lines, similar to San Francisco's trolley buses, are in development in Europe. They are cheaper than rail, and may be a long-term option for delivery of larger items within the City, since San Francisco already has an extensive system of trolley lines.

##### **6B.3.2 Evaluate construction projects in light of future fuel costs and potential shortages.**

**Projects** which block future rail or water cargo infrastructure should be avoided. Other projects which depend on continuing availability of fossil fuels should be reconsidered in light of peak oil. San Francisco needs to take the long view in this arena.

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### **6B.4 Recommendations**

**6B.4.1 Enlarge the railway tunnel giving access to the port.**

**6B.4.2 Formulate a plan to build a modern freight rail facility in San Francisco.**

**6B.4.3 Develop the southeast waterfront to take advantage of the coming rise in short haul water freight.**

**6B.4.4 Approach package delivery companies to develop pilot programs for bicycle delivery of smaller packages.**

**6B.4.5 Evaluate plans for use of land along the port, rail lines and airport in light of the predicted mode shift in freight hauling, to prepare for increased rail and water shipping and decreased air freight.**

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### **Endnotes:**

<sup>1</sup> 2002 Commodity Flow Survey, a partnership between the U.S. Department of Commerce, Bureau of the Census, and the Bureau of Transportation Statistics of the Department of Transportation, quoted in East-West Gateway Council of Governments Data Center, [www.ewgateway.org/DataCenter/STLRegData/Trans/FreighShare/freightshare.html](http://www.ewgateway.org/DataCenter/STLRegData/Trans/FreighShare/freightshare.html)

<sup>2</sup> *ibid*

<sup>3</sup> Parajuli, L. Ferreira, and Bunker, J., Freight Modal Energy Efficiency: A Comparison Model

<sup>4</sup> <http://flysfo.com/web/page/about/b2b/cargo/>

<sup>5</sup> Randy Mullett, Transportation Research Board, Associated Press, May 29, 2008

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## **7. WATER SUPPLY**

**7.0 Introduction** This chapter and the following two focus on agencies and departments of the City and County of San Francisco (City). As directed by the enabling ordinance for this task force, the emphasis is on those elements dealing with water supply, waste collection and disposal, and emergency services. Moreover, the task requires focus on the potential impacts of fossil fuel use.

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Since the City's electricity is largely provided by the Hetch Hetchy hydro-electric system, its electricity supply is relatively immune to the effect of Peak Oil and Gas. Use of vehicles will be most strongly impacted. Heating based on natural gas will become more expensive as well, and may at some point suffer from interruptions in supply.

It should be noted that San Francisco's Hetch Hetchy electricity is derived from water flow. Therefore, any long term conditions that could diminish water flow to the point of negatively impacting electrical production must be considered in long term planning.

### **7.1 Assessment of Current Situation**

The San Francisco Public Utilities Commission Water Department provides high quality fresh drinking water to San Francisco and several surrounding communities, 85 percent of which is sourced and delivered from the Tuolumne River watershed (225 million gallons per day). The delivery system is primarily gravity driven. In the fiscal year 7/1/08-6/30/09, it is projected that 62.7 MWh of power will be supplied to the system, representing 7.44% of the total power supplied to San Francisco by the San Francisco Public Utilities Commission (SFPUC) for the same period. The Water Department also operates a number of repair and administrative vehicles that run on either gasoline or diesel.

### **7.2 Vulnerabilities**

The Water Department's need for power is met easily from the Hetch Hetchy system and thus is not seriously impacted by future diminution of fossil fuel availability. Nevertheless, even now, there are times during the year when generation falls below even the City's municipal demand and power must be delivered by PG&E to make up the shortfall. Approximately 46 percent of PG&E's power mix comes from fossil fuels, i.e., 44% natural gas and 2% coal. There is a certain amount of excess power that SFPUC can "use" as a bank for these shortfalls, but not necessarily on a one-to-one basis.

A further vulnerability is that the Hetch Hetchy system operates on a "water first" basis. Thus, it is not always possible to store adequate water supply for power generation as needed.

As global warming progresses, it may lead to a possibility of more severe drought conditions. In a worst case scenario, this could exceed SFPUC's drought design, both in level of severity and length of time. (see [The Great Warming, by Brian Fagan, Bloomsbury Press 2008](#)).

### **7.3 Goals and Strategies**

**7.3.1 Explore the increased use of water storage to maintain an adequate level of power generation at all times during the year.** This may require stepping up progress in water conservation by San Francisco residential and commercial water users.

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**7.3.2 Create by conversion and/or replacement purchase a vehicle fleet not dependent upon fossil fuels.** The Water Department has plenty of power to pump water. Its Peak Oil and Gas vulnerability is in the maintenance area. SFPUC should move in concert with all city departments to reduce energy use and fossil fuel use in particular.

### **7.4 Recommendations**

**7.4.1 Review both the possibility of Raker Act and/or PG&E contract amendments to secure a more sustainable year-round generation of Hetch Hetchy power for San Francisco municipal government agencies and departments.**

**7.4.2 In keeping with City policy, pursue a more aggressive program of conversion of all Water Department vehicles and equipment to non-fossil fuel power.**

## **8. WASTEWATER**

### **8.1 Assessment of Current Situation**

The wastewater system operated by the SFPUC includes a city-wide sewer and storm drain system and a number of water treatment facilities. The total system is expected to draw 68.6 MWh of power from the City's power, representing 8.14% of the total municipal electricity use.

The wastewater group at SFPUC has been actively pursuing various alternative energy and energy-saving processes for co-generation of power and heating at the Southeast and Oceanside plants, including use of digester gases for process heating, and the installation of a 255 kWh photovoltaic project in the Southeast Plant, the latter providing 11% of the facility's power need.

### **8.2 Vulnerability**

The wastewater group has minimal vulnerability in the delivery of adequate power from the SFPUC. In fact, the group is expecting to make a significant contribution to mitigation for other departments through its greasecycle program detailed below.

### **8.3 Goals and Strategies**

The Wastewater group is pursuing a local fats, oil, grease (FOG) program to produce bio-fuel. Although production of bio-fuel for other department uses is not a regular activity of the wastewater group, keeping the FOG materials out of the wastewater treatment processes will improve efficiency and reduce maintenance costs. It is anticipated that the FOG project will go a long way to localizing the supply of bio-fuel for the City's current 80-20 program for city-owned diesel fueled vehicles, thereby avoiding the present necessity of bringing in bio-fuel from the midwest. This move is in keeping with the City's goal of achieving local sustainability.

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At the same time, the SFPUC is negotiating with operators of specific City vehicle sub-fleets (eg., Muni) to determine the feasibility of moving up the percentage of bio-diesel from the current 20%. There is a very real possibility that the FOG program can make the City's fleet close to 100% biofuel driven.

The use of digester gases to power the plant is also being pursued and has potential for expansion.

### **8.4 Recommendations**

**8.4.1 Accelerate the timeline for on-site generation of sustainable power.**

**8.4.2 Continue to pursue the FOG program.**

## **9. WASTE DISPOSAL AND RECYCLING**

### **9.1 Assessment of Current Situation**

Waste disposal and recycling carried out by the companies permitted by the City of San Francisco involve three streams of waste.

Recycling is the collection, processing, and shipping to market of paper, glass, metal, and plastic materials. In 2006, a total of 1.4 million tons of waste were diverted to recycling.

Green waste is the collection, transfer and delivery of food and other organic waste to the compost landfill facility in Solano County.

Waste disposal is the collection, transfer, and landfilling of the remainder of San Francisco's garbage. In 2006, a total of 663,404 tons were landfilled.

Most of the activities noted above are essentially trucking functions. The vehicles used are traditional front, side, and rear loaders; roll-off, roll-on drop box vehicles, and transfer trailers. All of these are commonly diesel and are currently operating with the 20-80 bio-diesel fuel now achieved by the City's diesel fleets as well. Darling Delaware Corporation has recently announced plans to construct a major bio-fuel manufacturing facility in the area. This local supply could increase the percentage of bio-diesel in the fuel mix that can be reasonably accomplished in the near term.

Transloading waste for transfer and recycling processing is managed by Sunst Scavanger, under permit from the City, and takes place at the Pier 96 facility. From there, material for landfill is sent to Altamont in Alameda County and the compostable material is sent to a landfill near Dixon, in Solano County where it is composted. At the present time, the finished compost is fed into the agricultural market.

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In 2007, the Pier 96 facility, in cooperation with SFPUC, installed a 245 kW capacity photovoltaic project.

The final significant activity is the marketing of the processed recyclables. Of course, whenever possible, material should be sold at a profit as a mitigation of cost of service to the public. As a last resort, however, it will be preferable to have the material used in a positive application as an alternative to landfilling even if no revenue is forthcoming. Also, with a Peak Oil and Gas perspective, local end-use markets will be preferred.

In this regard, the container glass market is very good in California. Glass, being both heavy and relatively low-valued per ton, requires local marketing. Fortunately, there are glass container manufacturing facilities in both northern and southern California and corollary preparatory processing companies as well. These facilities will be especially useful if there is an increase in demand for local food preservation containers.

Half of the rigid plastic recyclables are currently marketed to a local manufacturing facility producing bender board, a landscape edging material. This material is expected to diminish over time as petrochemical plastics become more expensive and are increasingly replaced by carbohydrate-based polymers.

Metals and paper are primarily marketed into Asia, although limited amounts of each can still find domestic users. Although India is experiencing an industrial boom, the relatively high Chinese demand remains the overwhelming reality.

### **9.2 Vulnerabilities**

**9.2.1 Rising fuel costs, leading to rising costs to residents and businesses.** Without reasonably priced local bio-diesel, the rising cost of fuel will be an important factor contributing to rising service costs to the consumer, but it is not anticipated that the quality of service will be negatively impacted although a greater financial strain would be placed on the using public.

Fuel costs for transferring the waste to the Altamont landfill, 50 miles distant, will continue to rise. Although the City has adopted a zero-waste goal, much of the material remaining to be diverted will be organic and suitable for composting. Since the present location for composting is located 60 miles away, a significant reduction of transfer load-miles is not be anticipated as the zero-waste goal progresses.

**9.2.2 Loss of revenues from recycling, also leading to rising service costs.** A special note should be made here concerning the collection of recyclables. There has long been a problem of the illegal scavenging of material intended for collection by the permittee. This is particularly true for material left out at the curb for pickup, mostly from residential sources. It is also probable that the degree of scavenging escalates as the value of the commodity increases in the market and/or

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the numbers of those experiencing economic hardship increase in the community. As the impact of peak oil increases, along with increasing global demand for most resources, we can expect a more sustained and growing problem of resource scavenging. Recognizing that the scavenged material will also find its way into the marketplace, the significant negative impact will be increased cost of services by the permittee due to loss of revenue and increased problems of litter. Since these increased cost will invariably be passed on to the citizenry, it can be seen as yet another economic hit added to an increasing burden.

In the marketing of recyclables, the current global economic slowdown has resulted in a dramatic lessening of demand for these commodities accompanied by severe price drops. However, the need for strong North American fiber and metal scrap, using the advantage of a weaker dollar, will help to recover this export market for the foreseeable future. We are also fortunate in having two major world-wide metal scrap companies located in Oakland (Schnitzer and Sims) as outlets into the global metal marketplace.

### **9.3 Goals and Strategies**

**9.3.1 All service vehicles in the permittee's fleet should be transitioned away from fossil fuels.** At least two garbage truck manufacturing companies, International and Volvo, are currently producing hybrid collection vehicles, which could be an interim step. Since much of the collection truck activity involves short movements and idling, hybrids would greatly reduce fuel need. A schedule of conversion should be required as a condition of the next rate negotiation. Clearly it is in the interests of the residents of San Francisco to hold future service fees down.

**9.3.2 The Pier 96 facility should move steadily toward being powered by facilities located on-site.** The recent solar voltaic installation is just the first step.

**9.3.3 Compost generated from San Francisco's waste stream should be processed locally and used for the benefit of local food programs.** As detailed in Chapter 5 on Food Security, the decline of fossil fuel availability will result in increasing food prices, and declining food security, especially among economically vulnerable San Franciscans. Programs for growing food within city limits will need to be expanded. San Francisco's sandy soil would benefit from the addition of composted organic waste. The city should begin identifying possible locations for neighborhood composting centers. To encourage backyard composting – and gardening - a portion of current green waste disposal fees could fund a program to subsidize the giveaway of compost bins, as many suburban communities do.

**9.3.4 The City should consider ways in which it could make use of recycled materials locally generated to boost the city's manufacturing economy.** The FOG program is an example of such a project, which is well on its way to a successful public-private partnership. In addition to greases, San Francisco has many other potentially reusable waste streams.

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### **9.4 Recommendations**

**9.4.1 The City should require its permittee to replace its present fleet with currently manufactured hybrids, and eventually with electric alternative vehicles.**

**9.4.2 In its rate process with the permittee, the City should develop expanded lifeline rates for lower and moderate income citizens.**

**9.4.3 In keeping with its policy of moving toward local sustainability, San Francisco should identify alternative composting sites, either within city limits with a neighborhood focus, or significantly closer than the current Solano site.**

**9.4.4 The Controller's Office should undertake studies to evaluate the potential for local product manufacturing, utilizing the supplies of recycled materials locally generated.**

## **10. EMERGENCY SERVICES**

### **10.0 Introduction**

Emergency services in San Francisco encompasses an exclusive department but also includes the first responders, i.e., the departments of police, fire, and public health. Transit agencies and other units and/or personnel may be brought into the planning and execution of required services.

Traditionally, the focus of emergency services planning has been that of localized natural and/or physical disasters, such as earthquakes, floods, extensive fires and, more recently, potential terrorist attacks. All traditional disaster planning has been justified on the following bases:

1. The disaster will happen at some time in the future.
- 2.. The specific time of the event is not known.
3. If there is no advance planning and preparation, it will be too late when the event occurs.
4. The event will be essentially localized, so that planning could reasonably rely on outside assistance within a relatively short time. As an example, in San Francisco this belief has been manifested in a program emphasizing preparedness for 72 hours after a disaster.
5. Finally, the focus of such planning is to minimize damage and to **maximize recoverability to pre-disaster conditions** as quickly and efficiently as possible.

### **10.1 Assessment of Current Situation**

#### **10.1.1 The San Francisco Department of Emergency Services**

As noted above, this department has been engaged in traditional disaster planning and, insofar as can be determined within the scope of this report, said planning seems to be on a par with similar planning efforts elsewhere.

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An element of special note that cuts across all participating elements is that of communications. San Francisco is currently participating in the development of the SF Bay Area Regional Interoperable Communications System (BayRICS) and is in the implementation phase (having purchased and installed equipment) along with Marin, San Mateo, Santa Clara, Alameda, and Contra Costa. Power backup for the system in the event of grid shutdown commonly involves battery packs for immediate change until backup diesel generators can be kicked in.

Currently, all City-operated diesel backup generators, including those in hospitals, use standard fossil-fuel diesel. Bio-diesel is not considered an option because it tends to degrade more quickly and therefore is deemed less reliable.

#### **10.1.2 The San Francisco Police Department (SFPD)**

The SFPD vehicle fleet is comprised of 338 marked patrol cars, 400 plus unmarked and specialty vehicles, and 110 motorcycles. Nearly all of these vehicles have received exemption from the Board of Supervisors Resolution #107-06 calling for use of alternative hybrid and electric vehicles wherever feasible. It should also be noted here that the Department also maintains 250 bicycles, 45 dirt bikes, and 19 horses.

Total electric power delivered to the SFPD is projected to be 6.1 Mwh for fiscal year 08-09, or seven tenths of one percent of total power delivered to City units. This power is paid for from the general fund budget allocated to the SFPD.

In 2004 the SF Board of Supervisors passed Resolution 431-04 calling for a transition of all General Fund units from SFPUC subsidized rates to full service rates. The General Fund subsidized rate of 0.0375 per kWh was to be transitioned to the full service rate of 0.08822 per kWh. In the final transition step, the SFPD will pay a 19.2 % increase to SFPUC. However, even at full rate, the charges are a minuscule percentage of the annual budget..

#### **10.1.3 The San Francisco Fire Department (SFFD)**

The SFFD was one of the first city agencies to initiate a project to determine the feasibility of using biodiesel in their vehicles. By now, almost all of their vehicles use B20 regularly and a few remaining use B20 occasionally.

Total electric power delivered to the SFFD projected for fiscal year 08-09 is 4.4 MWh, or three tenths of one percent of total power delivered to City units. At full cost of service the total power billed by the PUC would be approximately three tenths of one percent of their annual general fund budget.

#### **10.1.4 Public Health**

In addition to the ambulance fleet operated by SFFD, there are hundreds of private ambulances that the City emergency response relies upon. So far as the Task Force is aware, all of these ambulances operate on gasoline or diesel fuel.

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### **10.2 Vulnerabilities**

In the arena of emergency response, there are three new types of vulnerability arising from Peak Oil and Gas:

3. Lack of fossil fuels available to respond to other types of emergency.
4. Interruptions in fossil fuel supply as its own new class of emergency, and
5. Increased potential for civil unrest due to fuel shortages or economic disruptions resulting from energy price spikes.

These are new possibilities that emergency responders need to take into account in preparing their portfolio of response plans.

#### **10.2.1 Department of Emergency Services**

For vital communications and other essential backup generators, continuing reliance on fossil-fuel diesel will be a long-term vulnerability. There should be plans for shortages and supply interruptions.

Sudden price spikes or breaks in the supply chain of oil or even natural gas could be regional, national or even global occurrences. (For instance, imagine that a terrorist strike puts a major Saudi oil field out of commission for months.) The City may not be able to rely on outside assistance of any consequence. Further, there could be a long delay before returning to the conditions that existed prior to the event. In the long term, the ongoing process of Peak Oil and Gas will make fossil fuel-based disaster response impossible. At the present time, there does not appear to be serious planning effort to address those potential disaster events which may occur on a global scale and thus preclude any substantial aid from outside.

#### **10.2.2 Added Potential for Civil Unrest**

The early impacts of peak oil are already upon us. Climbing gasoline prices and their equally devastating impact on food prices are affecting the daily lives of increasing numbers of our citizens. However, peak oil does not exist in a vacuum. These conditions are being exacerbated by the mortgage debacle, the weakened U.S. dollar, the war drain on our economy, the rising cost of many raw materials, and the like. We are entering a period of severe economic distress that many analysts believe will not be short-lived.

Traditionally, at times of worsening economic conditions, eg., the Great Depression of 1929-32, there is an increase of illegal activities and violence growing out of desperation, rage, frustration, and hopelessness. What is of special interest to security forces, is that we can expect to see people engaged in illegal or otherwise socially unacceptable behavior that have, heretofore, been average law-abiding citizens. This will be especially so as more families find it difficult to manage continuing provision of basic needs such as food and shelter.

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We are already seeing an increase in illegal gas siphoning and scrap material scavenging, not only from recycling curbside programs, but from empty buildings, construction sites, etc. As conditions worsen, rage and frustration may result in actions against perceived “responsible” parties such as oil company offices, gasoline stations and delivery trucks. Alternatively, the latter two may become targets for more serious theft.

#### **10.2.3 Police Department and Fire Department**

The police have the largest single fleet of vehicles in the city which remains committed to almost the exclusive use of gasoline. Most patrol cars operated by agencies on the local, county, state, and national levels use similar specifications and the most commonly used model is the Ford Crown Victoria. To date, no particular action has been taken by the using agencies to determine if Ford, or any equivalent car manufacturer, can develop a hybrid or alternative fuel vehicle to meet the specifications for patrol cars that now exists. The Fire Department's continued dependence on fossil-fuel diesel will be a mid to long term vulnerability. As far as can be determined, there has been little movement to develop fire vehicles using alternative power other than bio-fuel.

#### **10.3 Goals and Strategies**

**10.3.1 San Francisco should develop a long-term plan to wean its emergency service vehicles off fossil fuels.** It is tempting to exempt the police department, but there is clearly plenty of room for improvement without loss of effectiveness. There is already a company, Carbon Motors, that is offering a fully-spec black & white that can run on bio-diesel. In addition, many police activities now using standard black-and-white cruisers could be performed equally well or better with alternative vehicles. Other cities are moving strongly toward neighborhood electric vehicles, bicycles, horses, or segways for duties in which high speed chases are not anticipated.

**10.3.2 Insure the operability of backup generators and other vital systems in case of loss of regular fuel supplies.** The City should develop long-term, ongoing planning for power and fuel requirements necessary to maintain plant, equipment, and vehicles at all times, even if conditions may arise that preclude the expectation of significant outside assistance. It may be time to install a tank of backup fuel for emergency vehicles and generators for disaster situations. Short term, the City should consider whether it has adequate access to fuel in case of interruption of the usual supply network. In the long term, vital San Francisco facilities should replace diesel generators with alternative fuel systems as soon as possible.

**10.3.3 The SFPD should undertake a review of its coverage of the city in terms of increasing civil unrest.** For example, a more sustained neighborhood, personalized presence of foot-patrol officers, as recently recommended by an outside consultant, may be desirable to help build cohesion and solidarity in our community. This idea has already been suggested in a recent consultant study. In addition, if it is anticipated that such conditions may also generate an environment of increased civil unrest, it is incumbent upon planners to develop strategies to cope effectively with such unrest.

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#### **10.4 Recommendations**

**10.4.1 The Department of Emergency Services should investigate the feasibility of replacing all backup diesel generators with hydrogen fuel cell or other non-fossil fuel systems.**

**10.4.2 SFFD should encourage manufacturers to develop alternative fuel vehicles meeting all fire department specifications.**

**10.4.3 SFPD should develop a plan to transition to alternative fuel vehicles. The Department should join with sister agencies in challenging Ford and other manufacturers to build alternative fuel vehicles meeting patrol car specifications.**

**10.4.4 SFPD, in conjunction with SFFD, should prepare to beef up security of gasoline depots, service stations, and other facilities that could be potential targets of vandalism or crime in a potential energy crisis.**

**10.4.5 SFPD should evaluate ways to increase the use of alternative patrol and control equipment, including horses, electric scooters and neighborhood vehicles, bicycles, etc.**

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## **11. BUILT ENVIRONMENT**

### **11.0 Introduction**

This section of the report addresses the built environment - the homes, apartment buildings, offices, commercial buildings, parking garages, and other brick & mortar edifices that comprise the built environment of the city.

The good news is that so much has been built, thanks to the energy rich petroleum endowment of the late 19th, 20th, and early 21st centuries. The bad news is that much of what has been built was not built with the concept energy efficiency in mind. It was also not built in anticipation of a need for retrofitting with on-site power generation to compensate for remote power supply limitations. These two measures – the implementation of energy efficiency and on-site renewable energy generation on buildings – comprise the crux of this section of the report.

### **11.1 Assessment**

The 115,315 owner-occupied houses and condos, 214, 385 renter-occupied apartments, 461 high-rises, 250 historical buildings, 150 theaters, 62 museums, in San Francisco account for approximately half of the city's total energy use<sup>1</sup>.

Nine hundred and forty-four of the City's 195,000 rooftops are currently fitted with solar photovoltaic panels<sup>2</sup> and four are fitted with wind turbines.<sup>3</sup> It is not possible to know how many local buildings are in need of retrofits for energy efficiency, but it is plausible to assume that most are.

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Approximately 80% of the energy used by San Francisco's buildings is fueled by natural gas. Just over half is the direct use of natural gas for space heating, water heating, and cooking. The remainder is electricity generated by burning natural gas. (See Chapter 3 on Energy for more detail on energy use.)

San Francisco's "Energy Watch" Energy Efficiency Program<sup>4</sup> is designed to help small businesses and owners of commercial or multi-family properties obtain energy-saving lighting, HVAC equipment, refrigerators, and other devices; it does not cover single-family homes. In 2008, San Francisco established the "Solar Energy Incentive Program" to increase the number of solar photovoltaic systems in the City by offering direct cash payments to property owners who install PV equipment.<sup>5</sup> The San Francisco "Solar Task Force" is currently evaluating additional methods for increasing the number of solar generating facilities in the City.<sup>6</sup>

Among today's renewable energy technologies, the one that is generally thought to provide the highest return for every dollar of investment is solar hot water. Solar hot water replaces boilers and tanks which are virtually 100% reliant on natural gas. Solar hot water is simpler and requires fewer exotic elements to manufacture. However, while hot water is valuable, it is not versatile. Electricity, on the other hand, can be used for many purposes, including providing us with hot water. The City is actively working to bring more solar generating capacity to San Francisco. The Solar Energy Task Force is currently evaluating the best routes for maximizing solar power in San Francisco.

#### **11.2 Vulnerabilities**

In their current state, the buildings in San Francisco rely heavily on natural gas. They will not serve their inhabitants well as the price of natural gas rises and its availability diminishes in the post-peak era.

##### **11.2.1 The Green Building Ordinance is a good first step, but it is not enough.**

The City and County of San Francisco (City) recently adopted a Green Building Ordinance (GBO)<sup>7</sup> for new construction that focuses on climate change and general environmental issues, as do all of the similar ordinances that have been passed in other jurisdictions. This is a forward-thinking step, but the LEED standards on which the GBO is predicated do not address Peak Oil and Gas concerns, which require giving foremost consideration to a building's energy use. Recent studies have found that in terms of energy use, up to 30% of LEED platinum rated buildings perform no better than conventional buildings.<sup>8</sup>

In addition, the ordinance applies only to large commercial buildings. Yet the City may find it too easy to rely on this ordinance for its entire green building policy. As one study found:

*"The energy impacts of better fan systems in climates where economizers are used can result in 20 to 50 percent lower HVAC energy use! We have often found that designers are overlooking these options because they are not rewarded with additional LEED points. Once a building is built these things are often impossible to retrofit. This represents a huge lost opportunity."*<sup>9</sup>

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### **11.2.2 Cost-benefit calculations based on projecting today's conditions forward do not properly reflect the real value of energy upgrades. Though energy improvements have long payback periods, they more than pay for themselves over the life of a building.**

Better buildings cost more. The Task Force believes that this cost should be viewed as an investment in San Francisco's future that repays itself not only in lower utility bills and reduced operating costs, but also by improving San Franciscans' quality of life, increasing the ability to maintain a municipal transportation system and other city functions, and maintaining as strong a local economy as possible when energy is scarce. The dollar cost of energy performance enhancements may seem high today, but the results will be invaluable tomorrow.

*"The point is, if we don't treat energy as a long term investment, we will end up paying much higher bills. ... We owe it to our children and to future generations." Dutch Crown Prince Willem-Alexander, Prince of Orange and the Netherlands<sup>10</sup>*

There is a widespread presumption that energy-saving measures cost more and deliver less benefit than they actually do.<sup>11</sup> The problem is that the market value of green buildings today fails to adequately reflect the real present value of the energy savings. The "business as usual" economic model used by most investors is not a useful guide for planning to cope with low-energy scenarios. Because this model assumes that future patterns of energy flow will be a reflection of past patterns, it regards the costs of lessening the built environment's need for energy as too expensive to be worthwhile. However, as a result of continually escalating energy prices, every dollar invested in demand-side management today will have an ever-shorter payback period and an ever-higher rate of return. Moreover, in a world in which there is the possibility of intermittent interruptions in the availability of fossil fuels, on-site generation and energy efficiency have a value beyond their dollar savings, as well as protecting against energy price increases.

*"A one-time investment in a solar electric photovoltaic (PV) system acts as a highly effective hedge against energy inflation and lowers electric bills for decades while delivering a clean and reliable source of power."<sup>12</sup>*

In addition to underestimating future increases in energy prices, another way in which energy improvements are undervalued is by assessing their benefits too narrowly. As one 2008 study put it:

*"... the direct energy savings associated with choosing a better window technology may not justify the cost – and the linear design process rejects the upgrade. But the integrated design process goes on to determine that the window upgrade allows a smaller, more efficient HVAC system—with total cost savings that justify the window technology upgrade."<sup>13</sup>*

And another:

*"The market has struggled to calculate the value of Green buildings, because Green building benefits such as longer lifespan, reduced replacement and lower operating costs are not easily expressed when accounting methods use depreciation only."<sup>14</sup>*

### **11.2.3 Split Incentives**

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Approximately two-thirds of San Francisco's residents rent rather than own their homes. Few landlords are interested in spending money that will lower their tenants' energy bills, and few tenants are interested in spending money to improve properties they do not own. The term used to describe this situation is "split incentives." Split incentives are a form of market failure, and problems that are not solved by market forces – or not solved quickly enough – can be resolved by government action.

#### **11.2.4 Availability of economic and material resources may decline.**

The City cannot start installing generating equipment and improving the energy performance soon enough. The difficulty of obtaining financing in the current credit market and questions surrounding the strength of local real estate prices have already started to discourage investment in buildings. When declining amounts of energy lead to a decline in economic strength (see Chapter 4 on the economy), capital for improvements or new construction will become less available. If no action is taken now, a key opportunity to increase the energy performance of the built environment may be lost. Inadequate investment today could mean that future San Franciscans will find themselves living and working in buildings that do not provide the comforts and amenities that they are accustomed to.

Besides limiting financial resources, Peak Oil may impact the availability of the materials and energy needed to construct, repair, replace, improve, or demolish the built environment. The mining, processing, and shipping of construction materials is very energy intensive. For running heavy equipment in isolated areas, where mining operations are typically located, petroleum availability is vital. Thus, materials prices may increase faster than general costs. The resources needed to upgrade the building stock may become increasingly scarce and expensive as the world continues to transition into the low carbon age. In a worst case scenario, they could be unavailable at times.

#### **11.2.5 High-rise buildings will be vulnerable to power interruptions.**

High-rise buildings require reliable energy to operate elevators and pump water. They will be less able than shorter buildings to generate their own power through solar panels. There may be times during the transition away from fossil fuels when San Francisco may experience extended power outages.

In addition, shadows thrown by tall buildings, which can extend for hundreds of feet, will limit San Franciscans' ability to use sunlight to generate electricity, heat water, and provide warmth to indoor spaces. Shadowing will also limit the types and amounts of food that can be grown.

#### **11.2.6 Leakage**

San Francisco's current building inspection procedure does not reveal whether windows, doors, pipes, vents, and skylights have been properly installed.<sup>15</sup> Since leakage is thought to account for

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around 10% of home energy consumption nationwide, expanding the inspection procedure to check for leaks should improve the energy performance of local buildings.

### **11.2.7 San Francisco's old and energy-inefficient building stock turns over very slowly.**

San Francisco's land use patterns are already fully established. The city is said to be 98% built-out. Over time, height and bulk restrictions may be changed, an increasing number of areas may be devoted to mixed-use development, and other minor changes may occur, but the basic patterns are embodied in the city's existing buildings and are not amenable to large-scale reinvention.

### **11.3. Goals & Strategies**

The goal of equipping buildings to better withstand Peak Oil and Gas exigencies is to allow San Franciscans to live as well as possible in an energy-constrained environment. The two paths to achieving this goal are first, to reduce buildings' need for energy and second, to equip local structures with the capacity to generate as much energy as possible from renewable sources.

*“Currently available, cost-effective technologies could significantly reduce the energy consumption of residential and commercial buildings, and the United States is making inadequate use of these measures.”*  
– American Physical Society<sup>16</sup>

The prevailing attitude toward real estate development and management, in which short-term financial considerations have dominated the decision-making process, worked acceptably as long as energy was abundant and cheap. However, it will prove to be a liability in the post-peak era. Many mitigation strategies do not have short pay-back periods, but are nonetheless advisable because they afford the advantage of allowing residents to continue having energy, warmth, light, and other necessities and amenities that would otherwise be lost when fossil fuels become less available.

#### **11.3.1 Retrofit existing buildings to use less energy.**

In San Francisco there are far more existing buildings than potential new ones. To achieve the energy independence that will allow residents to live more rewarding lives in the post-carbon era, existing buildings should be retrofitted for high energy performance, by reducing the amount of energy they consume, adding generating equipment, or both.

There are already programs in place, both through San Francisco Department of Environment (SFE) and PG&E. However, though all PG&E ratepayers pay into an energy efficiency fund, but progress is achingly slow. When San Francisco's Community Choice Aggregation (CCA) is in place, then the City will be able to move ahead more aggressively to do energy audits and make retrofits.

Because of San Francisco's mild climate, the energy savings possible per dwelling unit are modest. Thus, the initial focus of existing programs has been commercial buildings and low

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income residences. The Task Force has no quarrel with this logic, but the City needs to pick up the pace.

San Francisco currently requires reassessment of real estate under four circumstances: 1) change in ownership; 2) change in use; 3) completion of major improvements; and 4) completion of new construction. All of these could become trigger points that require retrofits for energy efficiency, and the City is currently evaluating a time-of-sale requirement for energy conservation and efficiency improvements. The City could add another trigger point to cover smaller renovations, viz., any change to an existing structure whose value exceeds 10% of the property's pre-improvement value.

### **11.3.2 Require energy performance evaluations and disclosure (also known as “commissioning”).**

To allow potential renters or buyers of properties to make informed evaluations of the degree of energy performance that they can reasonably expect to receive, actual measurements of every building's usage should be conducted and published. Collecting this data will also help the City detect patterns of energy usage and monitor the effectiveness of its green building standards. Other jurisdictions are moving ahead on this concept. The European Union will soon require an energy evaluation at the time of sale and is now in the process of developing a label for buildings to inform users of a building's energy performance. Several of its member countries have already taken steps in this direction: France has a requirement that all transfers of title must be accompanied by energy performance audits; since January 1, 2001, England and Wales have required that developers provide “Energy Labels” for all new homes that publicly inform buyers and renters of a structure's energy fitness; the United Kingdom's Foresight Group is working on a plan to require annual energy audits of buildings.

Owners of underperforming properties should be given a time-limited opportunity to correct problems before being required to disclose information.

*“Researchers at Texas A&M University concluded that the average commercial building wastes 20% of its total energy consumption due to problems associated with poorly functioning systems that would be corrected by commissioning, and studies conducted by the Lawrence Berkeley National Lab have shown that the energy savings achieved by commissioning are highly cost-effective.”* <sup>17</sup>

Since the California Historical Building Code <sup>18</sup> exempts certain buildings from energy efficiency requirements, it may be necessary for the City to offer special enticements to owners of such properties.

### **11.3.3 Enact Performance-Based Standards for New Buildings.**

Decision-makers would be wise to prioritize energy performance when evaluating proposals for new development. The State of California already has a performance-based standard for the design of commercial buildings (Title 24)<sup>19</sup>. A similar standard for residential buildings is needed. San

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Francisco would be well-served by a performance-based building code that is dynamic and adaptive rather than prescriptive; incorporates new energy efficiency inventions and techniques as they become available and are shown to be effective; and is continually monitored and revised on an ongoing basis, as a result of lessons learned, to yield ever-increasing energy savings.

#### **11.3.4 Update and extend the Green Building Ordinance (GBO).**

As indicated above, the GBO should be developed adaptively, and its focus should move toward performance standards. In addition, the GBO should be extended to cover all new construction, regardless of the project's size, zoning, or other attribute. Finally, any future green building ordinance should ensure that compliance will be less costly than noncompliance. Fines or carbon taxes are appropriate in a situation like Peak Oil and Gas, in which the City's basic well-being is at stake.

Financing for new construction has almost vanished as a result of the current economic downturn. As a result, few new projects are expected to move forward soon. However, if a catastrophic event such as an earthquake were to necessitate the rebuilding of large swaths of the city, the GBO could become an important tool for mitigating against the impacts of Peak Oil.

#### **11.3.5 Progressively move building standards toward zero energy use buildings, with an eventual goal of "energy positive" buildings.**

Net-zero buildings are buildings that do not use any net energy through the implementation of energy efficiency measures and on-site electrical generation. The California Global Warming Solutions Act (AB 32) mandates the pursuit of a net-zero requirement for new buildings constructed after 2020 for homes and 2030 for commercial buildings. These are laudable goals, but it is the opinion of the Task Force that these timelines are not very helpful with respect to Peak Oil & Gas. San Francisco should take steps to accelerate the pace at which a net-zero requirement is in place for new construction in the City.

Beyond net-zero, energy positive buildings are a new innovation, and to date few have been constructed. Simply stated, they generate more energy than they and their accoutrements consume. This concept is not new, but it has only recently been looked at in earnest, as public concern over environmental threats has grown. To create an energy-positive building, two steps are necessary. First, conservation and efficiency are maximized so that the need for energy use is reduced as sharply as possible. Then a building is outfitted with enough clean renewable generating capacity to account for the amount of energy it requires for its operation and generate excess energy to feed into the grid.

These US buildings and others elsewhere in the world demonstrate that it is possible to construct energy-positive buildings using available technologies, though doing so requires more planning than is needed for conventional buildings. It may not be possible to provide sufficient on-site

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generating facilities in all instances, particularly in cases of high-rise buildings. Therefore, it may be necessary to allow some developers to site compensating electrical generating equipment at another location within the city limits.

### **Examples:**

Y Aldo Leopold Legacy Center in Fairfield, Wisconsin, the first in the nation, which produces 15% more energy than it consumes.<sup>20</sup>

Y Branchburg, New Jersey, a newly constructed 41,508 square-foot commercial building uses solar panels to generate more electricity than the building consumes and feeds the excess into the grid.<sup>21</sup>

The City should require that all new buildings are developed with a non-fossil energy generation complement that generates electricity from renewable sources sufficient to power all of its systems and plug loads. In many cases, it will not be possible to site enough generating equipment on the building itself, so protocols should be developed to allow for installing some or all of the generating equipment associated with a building off-site but within City limits.

### **11.3.6 Develop financial programs to overcome the split incentive problem and induce building owners and tenants to pursue energy conservation and generation.**

More than 60% of San Franciscans are renters. Thus, the dealing with the split incentive is vital in equipping the city's housing stock for the energy future. The City needs to develop and offer incentives to property owners and tenants. One possibility is feed-in tariffs, in which a utility company, in San Francisco's case CCA or PG&E, purchases electricity from owners of small installations of distributed generation at a guaranteed rate per kilowatt-hour. This approach has been widely used abroad, and is being introduced in the U.S. (specifically Wisconsin). It motivates building owners to install generation facilities, even though they themselves do not pay for the building's power usage. Another possibility is to allow the landlord to bill the cost of the installation in increments over time, to the tenants who benefit.

With respect to weatherization, San Francisco could require landlords to subsidize energy upgrades for tenants. For example, in Chicago, tenants are allowed to deduct half of one month's rent annually to spend on improvements of their choice.<sup>22</sup>

### **11.3.7 Continue to pursue policies encouraging the installation of distributed generation capacity.**

Electricity is a universal energy medium. It can be generated via a wide variety of primary energy sources, can be transmitted easily, and is used in a wide variety of applications. In the post-peak era, there may come a time when the city will rely far more on locally-generated electricity than it

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does today. Many of the best places to site generating equipment in a built-out city such as San Francisco are on structures.

Owners who occupy their properties have more options than renters. The city, state, and federal governments already have in place programs encouraging homeowners to purchase solar photovoltaic and solar thermal systems. These programs need to be pursued vigorously and expanded.

*“Among Bay Area counties, San Francisco ranks last in terms of solar energy installed per capita.”* San Francisco Assessor Phil Ting<sup>23</sup>

San Francisco property owners who retrofit their buildings with solar equipment can receive a \$6,000 cash incentive from the City plus receive a \$1.90 per watt rebate from the State of California plus receive a 30% federal tax credit. A two-kilowatt solar electric generating system, which can be reasonably expected to produce approximately 300 kilowatt-hours per month in the local climate, would cost its owner less than \$6,000. This expenditure would be recouped over time and after payback, savings would accrue every month.

Several solar leasing companies offer programs that allow owners to enjoy the benefits of solar photovoltaic panels without bearing the cost of purchasing them. The City is investigating following the lead of Berkeley, California, which pioneered the creation of a solar assessment district that allows property owners to finance the cost of solar panels through their property taxes over a 20-year period.<sup>24</sup>

Purchasers can obtain a “green mortgage,” a type of loan that accounts for the fact that people who pay lower utility bills keep more money for themselves and therefore are more creditworthy; such loans can cover the cost of the improvements as well as the building’s purchase price. Former President Clinton created a \$5 billion fund to retrofit existing buildings for energy efficiency, called the Clinton Climate Initiative Energy Efficiency Building Retrofit Program. San Francisco might be able to participate in this.

San Francisco may be able to benefit from new programs created by the current federal administration, which has proposed spending \$150 billion over the next decade to improve energy efficiency and create five million jobs. Among the projects is a proposal to make one million units per year more energy efficient. The City could direct its share of federal monies, in part, to improving the homes of renters, especially those occupied by economically vulnerable households.

#### **11.4 Recommendations**

**Require all new development to be zero energy buildings.**

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**Update San Francisco's Green Building Ordinance to prioritize buildings' energy performance, include all new construction activity, and ensure compliance. Make the updating of the GBO an ongoing process, with a final goal of requiring energy positive buildings.**

**Expand programs of retrofits to existing building stock for better energy performance.**

**Facilitate the financing of building retrofits for energy conservation and efficiency and for installation of solar panels.**

**Expand the building inspection procedure to include a blower door test to detect leakage.**

**Require energy audits of buildings upon sale, and make the result public record. This could be a first step toward incentives for low energy usage and penalties for high usage.**

**Create a solar assessment district to allow the city to finance the cost of solar panels for building owners, who then make repayments through their property taxes over a 20-year period.**

**Move ahead vigorously with the establishment of a city energy buying cooperative (CCA), so that the City can purchase distributed power from small installations, whether owner-occupied or not.**

**Adopt best practices from other jurisdictions to decrease energy usage. (See Appendix D)**

#### **Endnotes:**

<sup>1</sup> San Francisco Convention and Visitors Bureau, *San Francisco Fact Sheet*, [http://www.sfcvb.org/media/downloads/travel\\_media/sf\\_facts.pdf](http://www.sfcvb.org/media/downloads/travel_media/sf_facts.pdf) and *San Francisco County, California Detailed Profile*, [http://www.city-data.com/county/San\\_Francisco\\_County-CA.html](http://www.city-data.com/county/San_Francisco_County-CA.html)

<sup>2</sup> Johanna Partin, San Francisco Department of the Environment Renewable Energy Program

<sup>3</sup> To be inserted at future date.

<sup>4</sup> San Francisco Energy Watch Energy Efficiency Program <http://www.sfenergywatch.org/faq.html>

<sup>5</sup> San Francisco "GoSolar" Solar Energy Incentive Program [http://sfwater.org/mto\\_main.cfm/MC\\_ID/12/MSC\\_ID/139/MTO\\_ID/361?CFID=4484779&CFTOKEN=32979119](http://sfwater.org/mto_main.cfm/MC_ID/12/MSC_ID/139/MTO_ID/361?CFID=4484779&CFTOKEN=32979119)

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<sup>6</sup> San Francisco Solar Task Force  
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<sup>7</sup> The text of San Francisco's Green Building Ordinance can be found at  
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<sup>9</sup> McLennan, Jason F. and Rumsey, Peter, *It's Time To Give Credit Where (Energy) Credit Is Due*, 10 May 2004,  
<http://www.edcmag.com/CDA/Archives/ed19bb13fb697010VgnVCM100000f932a8c0>

<sup>10</sup> His Royal Highness, Prince Willem-Alexander, Prince of Orange, Crown Prince of the Netherlands, *Four peaks: Peak Oil, Gas, Coal and Uranium*, 19 January 2009,  
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<sup>11</sup> Davis Langdon & Seah International, *Cost and benefit of achieving Green buildings*, 2007,  
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<sup>12</sup> <http://www.quixotic-systems.com/solarelectric/index.html>

<sup>13</sup> *ENERGY FUTURE: Think Efficiency*, September 2008, American Physical Society ,  
<http://www.aps.org/energyefficiencyreport/report/aps-energyreport.pdf>, page 62

<sup>14</sup> Davis Langdon & Seah International, *Cost and benefit of achieving Green buildings*, 2007,  
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<sup>15</sup> Conversation with Debra Walker, Commissioner of the San Francisco Department of Building Inspection, May 2008.

<sup>16</sup> *ENERGY FUTURE*: <http://www.aps.org/energyefficiencyreport/report/aps-energyreport.pdf> *Think Efficiency*, September 2008, American Physical Society, pages 9 & 55

<sup>17</sup> U.S. Department of Energy's Lawrence Berkeley National Laboratory, *Berkeley Lab Will Develop Energy-Efficient Building Operation Curriculum for Community Colleges*, 09 December 2004, <http://www.lbl.gov/Science-Articles/Archive/EETD-college-curriculum.html>

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<sup>20</sup> <http://www.inhabitat.com/2007/11/08/first-leed-platinum-carbon-neutral-building/>  
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<sup>23</sup> Ting, Phil and Hochschild, David, *Solar City*, 11 December 2007, <http://www.sfgate.com/cgi-bin/article.cgi?file=/c/a/2007/12/11/ED4GTPKKT.DTL>

<sup>24</sup> City & County of San Francisco, *Controller's Office of Public Finance, Clean Energy Loan Program - Request for Proposals - RFP # 2009-01*, <http://www.sfgov.org/site/uploadedfiles/mayor/PressRoom/NewsReleases/CCSF%20Clean%20Energy%20RFP.1-30-09.FINAL.pdf>

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## 12. PROTECTING VULNERABLE POPULATIONS

### 12.0 Introduction

One of the greatest dangers of Peak Oil and Gas is that the energy situation will be left to market forces. Unless the government intervenes, a scenario could unfold in which the economically vulnerable are deprived, while the wealthy outbid them for food, housing, and warmth. Of course, this is a nationwide problem. This section will address the unique situation of energy justice in San Francisco.

### 12.1 Assessment of Current Situation

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Though San Francisco is a wealthy city overall, that wealth is unevenly distributed. In 2006 approximately 11% of San Francisco residents were below the Federal poverty line, with people of color over represented. About 150,000 San Franciscans are disabled (19% of the population), and 56% of them work.<sup>1</sup>

Far fewer San Franciscans are homeowners than the national average. Approximately 62% of San Francisco homes are rental units, whereas nationwide about two-thirds of Americans are homeowners.<sup>1</sup> Working class San Franciscans have less in assets than workers elsewhere. Households are said to be asset poor if they do not have sufficient assets, including savings, home equity and retirement accounts to support themselves for three months. By this definition, 37.4% of San Francisco households are asset poor, including 59% and 56% of African-American and Hispanic households, respectively.<sup>2</sup>

San Francisco's average household income has been rising, but income inequality is also on the rise. (This increasing income gap is being seen in cities throughout the United States.) Census Bureau statistics confirm what most San Francisco residents believe: the city is becoming ever more gentrified, with fewer low income households and more high income households. This appears to be due more to an inflow of wealthy households than to increasing incomes of people already living in San Francisco. In short, there is an ongoing exodus of low income residents from San Francisco, and they are being replaced by high income residents.<sup>1</sup>

The number of jobs available in the city has held steady, but its composition has changed. Primarily, the number of professional and managerial jobs has risen, while middle income jobs have been lost. There has also been a modest increase in service jobs, mostly low paying and serving the experience sector. In the aggregate, average wages have climbed in San Francisco, but the distribution of those wages is uneven.

Though San Franciscans of all income levels use public transportation, the bus system is used more heavily by the economically disadvantaged.<sup>3</sup> Discounted Fastpasses are available for low income individuals, but the discount is quite modest, only \$10. In addition, the availability of discounted Fastpasses is extremely limited, because they are sold at only two locations in the city during a four-day time window each month.<sup>4</sup>

San Francisco currently has in place land use policies, particularly with respect to parking, that add unnecessary cost to new housing. Each off-street parking space provided adds \$50-100,000 to the cost of a new residential unit, yet parking is required for most new development.

Bayview/Hunters Point was designated an environment justice neighborhood by the state in 1998. The San Francisco Department of Environment (SFE) has instituted a number of grant programs for low-income residents in that neighborhood, aimed at subsidizing energy efficiency and conservation measures, and the installation of solar panels for qualifying homeowners. Reaching vulnerable renters is a continuing and difficult problem.

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Currently, both public and private social services in San Francisco are nearly all automobile-based. *Meals on Wheels* alone serves nearly 1,500 homebound seniors, using volunteer drivers.<sup>5</sup>

#### **12.2 Vulnerabilities**

Initially, peak oil will manifest itself in two ways: rising transportation costs and damage to the overall economy. As the economy contracts, more people will become economically vulnerable. The city will need to allocate more resources to aiding the vulnerable, out of a shrinking resource base. The probable future will feature lower city revenues, as detailed in the Economy section, and greater demands on public resources. The temptation will be to address this as a short-term issue of the economic cycle, which will push the issue into the future, where it will be even harder to solve.

Because of San Francisco's robust transit system, bikeable size, and mild climate, transportation within the city will be less of a problem than in other cities. However, rising fuel costs will push more low income residents onto buses and bicycles. MUNI needs to be prepared for increased ridership. City government needs to recognize that facilitating bicycle transportation is a social justice issue. It also intersects with housing and land use planning.

Food is an energy issue. Food insecurity will become more prevalent as peak oil's impact manifests in the form of higher food prices.

The Task Force expects the disparity of income to intensify as wealthier people are attracted by San Francisco's big three: transit, climate and culture. Because of this in-migration, providing affordable housing will be more imperative than ever, in order to prevent the lower income San Franciscans from being pushed out of the city.

Though utility costs in the city are modest due to our mild climate, the cost of heating and cooking can still be a strain on the economically vulnerable. The majority of water heating, cooking, and space heating in San Francisco is fueled by natural gas. (See Chapter 3 on Energy.) Because renters are on average lower income than homeowners, energy justice programs should focus on tenants.

Current environmental justice grant programs are targeted on Bayview/Hunters Point. This is not the only low income neighborhood. Other neighborhoods have vulnerable residents in need of attention, and should also be eligible for grants.

Rising fuel cost will create budget problems for both public and private providers of social services, since many of these are provided in the home, entailing transportation now provided by fossil-fueled automobiles. For private charities, the recruitment of volunteer drivers will be more difficult. For public agencies, the cost of services will climb.

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Finally, there is the distinct possibility of food and energy supply interruptions. Other areas of the country have already had gasoline shortages. It is far from impossible for shortages of food, gasoline, even electricity, to come to the Bay Area.

#### **12.3 Goals and strategies:**

**12.3.1 Strengthen the social safety net.** Because the damage to the broader economy will be felt very soon (in fact, is probably already being felt as part of the current recession), many of our recommendations can be summarized as: Do more of the same things we do to provide food security, an economic safety net, and affordable housing for low income residents.

**12.3.2 Expand grow-your-own food programs for low income residents.** Green space needs to be protected, especially in low income neighborhoods. The search for land for community gardens needs to be intensified, and could include land owned by the City or the Public Utilities Commission, as well as land use negotiated with private owners of unused land. The Planning Commission should reject conversions of green space to parking or other uses (but especially parking!) unless absolutely imperative. See Chapter 5 on Food Security for much more on food and Peak Oil and Gas.

**12.3.3 Zone and design permitting for less driving.** The Task Force is aware that housing for the economically disadvantaged is a large and intractable issue, and that city government is pursuing many paths toward ameliorating it. One opportunity that Peak Oil will open up is to reduce the cost of newly built housing by providing less parking. As driving becomes more expensive, fewer people will own their own cars, so the future will see a decreased demand for parking. Though the timing is uncertain, this decline in driving - and parking - will certainly occur during the lifetime of buildings built or renovated today. Thus, providing built space for cars is a dead-end expenditure, which it is time to discontinue.

Building owners may increasingly choose to convert former garage space to living space or other uses. The Building Department should begin now to establish an expedited permit process for these conversions.

**12.3.4 Make public transportation reliable, convenient, electric, and inexpensive in all parts of the city.** The discount Fast Pass program should be expanded, its discount deepened, and its distribution made more convenient. MUNI should emphasize reliability on bus lines serving low income neighborhoods, where residents have fewer other options. To reduce the vulnerability of MUNI as a whole, and also serve low income neighborhoods better, expand the trolley bus service into the southern and eastern sections of the city by moving ahead with the trolley expansion plan, thereby reducing the dependence of this side of town on diesel fuel.

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**12.3.5 Search for new revenue sources to fund needed programs.** One possibility would be to institute a fee on all off-street parking spaces. Another is a carbon tax. San Francisco should encourage our representatives in Sacramento to introduce legislation broadening the taxes the City is allowed to levy, to include a city vehicle license fee, among other options. It is imperative that San Francisco address this as a long-term structural problem, rather than a short-term issue of the economic cycle.

**12.3.6 Plan for a wide variety of personal transportation options.** Bicycle transportation will be an especially critical element of transportation for the economically disadvantaged. It is vital to make bicycling safer and more convenient. Scooters, electric bicycles and scooters, neighborhood electric vehicles: all these will be a part of the transportation future, particularly for economically vulnerable residents. The City needs to plan to accommodate them. Implement the Bicycle Plan now - but don't stop there. Provision for bicycles and alternative transportation modes needs to be ongoing and vigorous.

**12.3.7 Focus renewable energy on low income neighborhoods.** Subsidies should be focused on non-homeowner households, because they are both the poorest and the hardest to reach. Public funds for solar and other "greening" programs should be spent on public housing first, and low-income residents next.

**12.3.8 Focus conservation programs on renters and low income residents.** Subsidies to landlords can be aimed at those with low-income tenants. Other jurisdictions have programs to subsidize landlords who weatherize units occupied by low income tenants, or have ordinances allowing tenants to allocate a portion of their rent toward conservation measures. The City could cooperate with a nonprofit agency to purchase in bulk simple efficiency equipment aimed at tenants, such as insulated blinds, making them available to residents at low cost.

**12.3.9 Convert social service workers who make home visits to neighborhood electric vehicles, transit, or bicycles.** The cost of auto travel will increase, and the city and other providers will have to be creative in finding ways to continue to provide home-based services. The city could offer incentives to switching away from fossil-fueled cars, and disincentives to continued auto use.

**12.3.10 Prepare for potential food and energy supply interruptions.** The allocation of living essentials should not be left up to the market, because low-income people will be shortchanged. This is not only a social justice issue, but also will avoid long lines and decrease the potential for civil disturbances.

**12.3.11 Encourage neighborhood cooperation.** Other cities have formal neighborhood councils, established forums for neighbors to work together and to provide input to city government. Setting up a structure of this type would help vulnerable residents work together to weather hard times. In case of shortages, it could be the basis of distribution of food and other essentials. San Francisco

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has a program of neighborhood grants already, but this could be expanded and administered jointly with the neighborhood councils.

**12.4 Recommendations**

**12.4.1 Expand programs assisting low-income families to grow their own food.**

**12.4.2 Protect all current green space, to maximize San Franciscans' ability to grow their own food.**

**12.4.3 Eliminate all parking requirements for new residential construction, to lower cost of new housing.**

**12.4.4 Lower the cost of MUNI Fastpasses to low income San Franciscans and make discounted passes easier to obtain.**

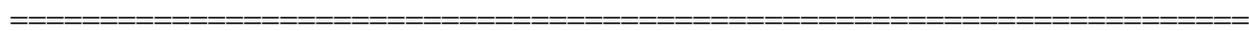
**12.4.5 Implement the Bicycle Plan. Then do more.**

**12.4.6 Find new revenue sources, both for poverty programs and to allow MUNI to expand and improve its service.**

**12.4.7 Enact a streamlined permitting process to legitimate and encourage the establishment of "in-law" units.**

**12.4.8 Expand programs to reduce energy use in low income residences, targeting especially renters.**

**12.4.9 Prepare a rationing plan to allocate scarce resources in the event of supply interruptions.** This should be done on a per capita basis, not a percentage reduction from current usage.



**ENDNOTES:**

<sup>1</sup> Unless otherwise noted, statistics on SF economy are from Mayor's Office of Economic and Workforce Development, *Sustaining Our Prosperity: The San Francisco Economic Strategy*, November, 2008

<sup>2</sup> Asset Poverty Initiative California, <http://www.assetpolicy-ca.org/lapi.vp.html>

<sup>3</sup> Transit Effectiveness Project, MUNI

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<sup>4</sup> [http://www.sfhsa.org/files/HSA\\_Files/MUNILifelinetemplate062107.htm](http://www.sfhsa.org/files/HSA_Files/MUNILifelinetemplate062107.htm)

<sup>5</sup> [http://www.mowsf.org/about\\_mow.html](http://www.mowsf.org/about_mow.html)

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### **13. SOCIETAL FUNCTIONING: PUBLIC RESPONSES AND EDUCATION**

#### ***13.0 Introduction***

In 1973, people throughout America found themselves unexpectedly waiting in long gas lines. Many Americans experienced tension, some even panic. Though the timing of Peak Oil and Gas is uncertain, there is no doubt that it is coming. Since we know that oil production and supply will decline over the coming years, we have the opportunity to help people prepare psychologically for it.

Beyond the various energy efficiency and conservation efforts that the Department of the Environment and other agencies are already engaged in, critical societal issues will need to be addressed. Citizens can make a significant contribution to mitigating the effect of Peak Oil and Gas on the City, provided they can be motivated to act. Conversely, a frightened and confused citizenry can retard official efforts to cope. Since the functioning of the City can be greatly affected by the attitudes of its citizens, it is important to anticipate their behavior, so that actions can be taken to channel these responses in more positive directions.

While there may be little we can do to affect the coming of Peak Oil and Gas, what we can do is to change our relationship to what happens and learn to meet our unknown future differently. Policies that help the public participate in preparing for Peak Oil and encourage the public to help each other through the energy transition are crucial to successfully mitigating the impacts of Peak Oil and Gas.

#### ***13.1 Assessment of Current Situation***

As of early 2009, the general public knows little about Peak Oil and Gas. The memories of those gas lines from 25 years earlier have mostly faded. The price of oil is low, and the financial crisis is people's top concern. If they are aware of Peak Oil and Gas at all, the vast majority of people rest complacently, in the belief that the combination of some conservation and alternative fuels will handle the problem with little necessity for significant change in lifestyle.

However, a few months earlier when oil was at an all-time high, and gasoline rose to nearly \$5 per gallon in the Bay Area, the shape of early public responses to peak oil were evident. People drove less and carpooled more. They eliminated some non-essential trips, and traveled slightly less on

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vacations. Business travel decreased.

As the price per gallon of the fuel many people depend on daily rose, seemingly inexplicably, something less measurable but no less real rose along with it: stress and anxiety. Part of the difficulty with Peak Oil and Gas is that there is no existing response model, no easy way out, particularly given how long the U.S. has already delayed its efforts to prepare. The challenge before the City is to do its best to anticipate the societal difficulties that may emerge as we enter the downslope of the Fossil Fuel Era, and to develop contingency plans based on this assessment.

### 13.2 Vulnerabilities

#### **13.2.1 Economic uncertainty and price volatility may cause anxiety, depression, and crime.**

Clearly the first effect that Peak Oil has started to have on behavior is to move people out of their cars. When prices reached their all-time high in the summer of 2008, there was a significant increase in public transit use in the Bay area. As the price of oil climbs back to those levels and beyond, we will likely see more of the same. To the extent that transit alternatives to driving are available, these changes will occur in a straightforward manner. However, should there be a rapid shift to public transit without adequate public preparation and increased available capacity, the overcrowding and lack of availability that are likely to result will undoubtedly lead to further social problems.

Falling oil production will have a lingering negative effect on the economy. Negative public responses to Peak Oil and Gas will tend to intensify in proportion to the magnitude of economic stress, shortages, and lifestyle changes forced on them by rising oil and natural gas prices. As oil and gas prices climb higher, the correspondingly higher price of food could result in food hoarding.<sup>lxvi</sup> In the face of expensive food, possibly coupled with unemployment, the most common psychological responses would be depression, anger, and fear. There will likely be increased criminal activity.<sup>lxvii</sup>

Anxiety will come not only from higher prices, but also from price instability. If San Franciscans don't understand what is going on and what they can do, the combination of unstable and climbing oil prices could lead to fear, desperation, and increasingly disruptive behavior. There may be an attitude of "every man/woman for himself/herself", destructive to the functioning of the community as a whole.<sup>lxviii</sup>

In response to anxiety, there are both rational and irrational response strategies that arise in people; sometimes both arise in the exact same person. People have a tendency to become more irrational as their stress and anxiety levels increase. There are numerous examples, both historical and current, of this effect.<sup>lxix</sup>

#### **13.2.2 In the worst case, the fabric of society could be at risk.**

At some point the price of oil could climb even higher, to \$300 and more per barrel. Without advance planning, such prices could lead to significant societal disruption.<sup>lxx</sup> With food becoming increasingly expensive, and unemployment increasing, travel and the distribution of goods significantly affected, economically vulnerable populations will experience increasing malnutrition, and some may not be able to maintain health without government

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intervention. Amid competition for scarce resources, criminal behavior, such as stealing and fighting, is a distinct possibility, and there may be protests against these deteriorating conditions.lxxi

From failure of multiple global systems – financial, currency or trade, for example – the early stages of a "societal disintegration" scenario could arise and would force governments to dedicate an overwhelming share of their resources to basic human needs. These extreme conditions could lead to a level of societal degradation that is difficult for most to contemplate.lxxii

How fast can things deteriorate? In 2000, truckers on strike in the U.K. resulted in the British economy coming to within 48 hours of collapse, with empty shelves at stores throughout the country.lxxiii The U.K. truckers' strike is but one example; there are numerous historical examples.lxxiv During 2008 alone, trucker strikes took place in country after country, some resulting in mass unrest, all because of the higher prices of fuel.lxxv

It is important to study and prepare for this kind of scenario because as we have seen in the financial crisis of 2008, unanticipated change can happen quickly. If San Francisco is to lessen the impact of these more extreme possibilities, a bold and concerted effort must be undertaken long before this kind of scenario starts seeming close to becoming a reality. The willingness to foresee what now seems unimaginable and to take steps now can help diminish societal disruption.

### **13.3. Goals and Strategies**

The federal, state, and municipal governments in the U.S. will need to match the efforts of other countries in helping keep the citizenry aware of Peak Oil and its ramifications. city government can play a key role in mitigating the extent to which people's behavior deteriorates, and can inspire more productive behavior, through implementing certain policies and taking certain actions. There is much precedent for government's role in educating, inspiring, and guiding, during times of societal stress.

The overall strategy to address people's responses to Peak Oil should have two parts – informing the public and encouraging more community involvement (problem-solving).

#### **13.3.1. Begin a public education program to inform, inspire, and guide San Franciscans, as well as mitigating anxiety.**

The City should provide three key functions:

- ÿ Inform the public about what will be happening,
- ÿ Inspire people to make a shift, and
- Guide them on how to prepare.

This education campaign should frame Peak Oil as a time of energy transition. It should pledge San Francisco residents to embark on this transition together, creating a common goal and common identity for the people of the City. The public education campaign must also inspire individuals, businesses, and other organizations to make specific changes in order to begin to prepare for the transition. The campaign should recommend what changes to make, and it should provide guidance and options as to how to make those changes.

*Inform the public about Peak Oil and the challenges and opportunities ahead :*

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First and foremost is informing the general public about Peak Oil and Gas. The City must be a primary educator of the public regarding this matter. Some key message points are:

- ÿ The age of cheap oil is ending.
- ÿ There will not be enough affordable oil.
- ÿ Biofuels will not be a large-scale substitute.
- ÿ We will move into energy descent.
- ÿ We can't have all our vehicles electric.
- ÿ Gas rationing will be forthcoming.
- ÿ Adaptation not prevention: We will need to change our lifestyles...and yet we're not going back to a pre-carbon time.
- ÿ Community is essential in this time of change.

### *Inspire the public to make shifts:*

Information alone does not motivate people to shift behavior. They need to be inspired to make changes. The government as an entity and individuals in government can take the lead in shifting the zeitgeist towards a low energy lifestyle. The Mayor can address the city, launching a campaign to promote a new identity for San Francisco as a low-carbon city and announcing that energy descent/transition is now a City purpose, and the City is officially tackling the task of transitioning to a low-carbon future, beginning with the adoption of the Oil Depletion Protocol. This campaign would include a website, slogan, commercials, and other advertisements.

### *Guide the people in preparing:*

Lay out some clear pathways to action that, if adopted en masse, will dramatically reduce the dependence on oil and gas.

### ***Lifestyle changes:***

Reducing dependence on cars  
 Eliminating or reducing purchases of non-necessities  
 Buying locally  
 Living locally – community events, meals, resource sharing  
 Changing dietary habits – including relying less on imported foods and moving to a simpler diet in which protein is acquired from grains, calories from potatoes  
 Less heating fuel, so living with the thermostat lower and taking less lengthy or frequent showers  
 Refocusing attention towards neighborhoods and communities. The City can provide guidelines for community governance.  
 Living and working collaboratively. Provide education in collaborative methods for decision-making and leadership.

### **13.3.2 Foster the emerging transition movement.**

The U.K. has taken a lead role by developing a model for peak oil mitigation and adaptation, to create, reframe, or organize communities. The "Transition Towns" model is a guide for towns to create "transition initiatives" to shift

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from heavy dependence on petroleum to independence from fossil fuels.lxxvi This model is designed to work well for small-to-medium-sized towns. It has yet to be implemented in any large city, and is currently being evaluated for use by a few London districts.

This model is primarily designed to be driven by the public who declare that they want to be a "transition place" and each place develops transition initiatives wherein the people take on the primary thrust of bringing out transition. initiatives provide the foundations for the development of the town's Energy Descent Plan, a flexible and modifiable plan to meet a rapidly-changing and unknown future.

The British government has taken an active role in: (a) keeping the people informed about likely future scenarios, and (b) making recommendations and distributing useful information for towns about how to transition to sustainable petroleum-independent communities. Over 80 towns in the U.K. have created, adopted, and are beginning to implement transition initiatives.

This has begun to spread to other countries. At the time of writing of this report, Transition U.S. was being announced to help coordinate the various transition efforts as they sprout up around the country.lxxvii

To ensure the implementation of the strategies and recommendations put forth herein, there needs to be an ongoing oversight body.

A "Transition Commission" would consist of both paid staff and volunteers. An office and funding would need to be established, perhaps under the auspices of the Department of Environment. This office would:

Oversee the implementation of those recommendations of this report adopted by the Board of Supervisors.

Coordinate peak oil, climate change, and other environmental city efforts among the various departments involved.

### **13.3.3 The Identity of a City – San Francisco as a "City of Transition"**

Preparing for Peak Oil and transitioning to being a low-carbon city needs to become a City purpose, part of the City's culture and identity. San Francisco has been known around the world as a forward-looking innovator. It's one of the reasons people live here. Thus, San Francisco is a natural leader among large cities in this.

For a large city, perhaps the most useful aspect of the Transition Towns model is the framing of the peak oil crisis as a *transition*. In that model, the people of a town decide to create an identity for the town, one that is actively and quickly moving towards a goal of having an economy and lifestyle that does not depend on oil. One way to achieve this is through creating an identity shift for the city itself. Such a town can be said to have *ownership* of being a transition town. When people embrace an idea, a concept, or an identity – such as being a transition city – it permeates and influences how they think and what they do, and can bring unity to people in distress, mental or otherwise.

Imagine a people, aware that the world is heading toward an unknown post-peak future and choosing not to be afraid or in denial about Peak Oil and Gas. Residents could see their beloved San Francisco as a city choosing to embrace and tackle the most difficult transition our society has yet to face. Accordingly, energy transition becomes an issue that people talk about, a value that they incorporate into their decision-making process, and a framework within which to understand the changes happening in their lives.

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In the early 1970s, New York City had a reputation for dirty streets, harsh people and rude behavior. In the middle of that decade, New York embarked upon an identity shift, unifying the city in its "I Love New York" campaign. New Yorkers had always taken pride in their city, to the point of heralding it as "the greatest city in the world," fiercely defending it against those who would issue an untoward utterance. Whereas New York's makeover campaign was designed to revitalize their shrinking tourism, it activated the heart and soul of the city, and the city became a more welcoming place to visitors – in part because of that shift in identity.

The City of San Francisco can create an identity campaign, albeit for different reasons, to similar effect as New York's. Such a campaign could easily lead to the involvement of neighborhoods and communities.

### **13.3.4 Problem Solving (Community Involvement)**

The second part of the strategy is to increase neighborhood involvement. The importance of community building is an integral part of maintaining stability, especially during the later phases of energy transition. Strategizing and problem-solving at the neighborhood level will be key to weaning the public from the current unsustainable system.

The government has three key coordinating roles to play here:

- ÿ Help coordinate the efforts of individual districts or neighborhoods. The San Francisco government can provide support and infrastructure for such an effort.
- ÿ Help establish local governance. Washington, D.C. has two types of neighborhood governance bodies: Neighborhood Planning Councils, used for decision-making within the neighborhood, and Advisory Neighborhood Commissions, that advise the city government on issues affecting their local areas.lxxviii
- ÿ Establish a relationship with Transition U.S.

### **13.4 Recommendations**

INFORMATION/EDUCATION:

**13.4.1 Create and promote an identity for San Francisco as a leading-edge transition city.**

**13.4.2 Develop and implement a peak oil public education program that informs, inspires, and guides the citizenry.**

**13.4.3 Support and enhance existing programs, and create new programs that assist people with emotional responses (despair, fear, anger) and help people psychologically prepare for unexpected changes.**

**13.4.5 Include Sustainable Energy Awareness in SFUSD curriculum.**

COMMUNITY AND SOCIETY:

**13.4.6 Create programs for supporting and coordinating community involvement.**

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6. Examine models for community, such as Transition Towns, to determine which aspects can be adapted to this city and the metro area. Support the efforts of districts and neighborhoods that create Transition initiatives.

Support the creation of neighborhood governance (Advisory Neighborhood Commissions, Neighborhood Planning Councils).

- 1) Help build neighborhood cohesion and develop neighborhood activities that help prepare for the coming oil decline.
- 2) Promote the use of neighborhood centers, schools and libraries, as places to meet and organize, places to recycle, as well as resource centers.

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### **14. Vision of Low-Carbon San Francisco - the City in 2050**

Obviously, the Task Force doesn't have a crystal ball to predict exactly how that world will look, but having spent the past 15 months studying this issue, we can make some educated guesses. We hope this brief summary helps bring our recommendations to life.

Imagine yourself transported to the San Francisco of 2050. Natural gas and petroleum are still flowing, but in much reduced quantities. They are devoted to vital functions, such as emergency services, air travel, and running heavy equipment. Through our municipal energy buying cooperative, a massive effort has expanded electricity from renewable sources, and nearly all the energy that powers daily life is in the form of electricity. Sixty-five megawatts of reliable tidal power comes from a turbine installed near the Golden Gate Bridge, and another two-hundred comes from offshore wind, marine current, and ocean wave power systems that are barely visible on the horizon from Ocean Beach. San Francisco has found a way to thrive on less than half the energy it uses today. This has been accomplished by reducing consumption, strengthening local communities, and localizing the economy.

The world and U.S. economies have changed. Internationally traded commodities are much more expensive, and thus, *stuff* is more expensive. International trade has receded and a thriving local economy has emerged in its place. The century-long trend of substituting fossil energy for human work has reversed. In many ways the material standard of living has changed, but surveys consistently show that San Franciscans are far "happier" than they were in the early 21<sup>st</sup> century.

The streets are full of pedestrians, bicycles, buses, electric scooters and neighborhood electric vehicles. When residents need a car, they check one out from a car-sharing stand, and the few gasoline-powered ones all get well over 50mpg. Mass transit is in full bloom. The Muni system is the circulatory heart of the city. Trains are full. Most bus lines are powered through overhead electric lines. Less frequented lines are served by buses powered by batteries, hydrogen fuel cells, or biodiesel. Biofuels are not being used to fuel private automobiles much, but biodiesel is used in trucks, buses, and heavy equipment. BART has its own source of renewable power. CalTrain has been electrified. Commuters check out bicycles from one of the bike sharing stations scattered about the city.

Nearly half the produce the city consumes is grown within city limits, most of the rest is delivered from within a radius of about 300 miles. Every possible open space in the city is devoted to gardening. It is all organically grown and of excellent quality. Many buildings have graywater systems, so that used household water is routed to backyards or community gardens. Numerous

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backyards hold chicken coops. Each neighborhood has a garden assistance center, featuring composting of organic waste and advisors knowledgeable about farming in San Francisco's unique mix of climate zones. Meat consumption is very low and the overall health of San Franciscans is improved over that of the early 21<sup>st</sup> century.

Most buildings in San Francisco are topped by solar hot water systems. Solar PV is ubiquitous. It is incorporated in horizontal and vertical south-facing walls of structures, painted on as PV paint, and mounted on free-standing structures in open spaces throughout the city. New buildings are required to be energy positive, producing more energy than they use. Existing buildings have been retrofitted with weatherization; energy audits and tune-ups are required every three years. San Francisco's mild climate has made it relatively easy to meet heating and cooling loads through conservation and efficiency. Fewer skyscrapers are being built, because of the high energy loads of buildings over six floors. Many former garages have been converted to residential space, or are being used for cottage industries, or for hydroponic gardens, which are competitive for fresh produce now that shipping costs are high.

National and world economies have stabilized at a lower activity level than today, and San Francisco has seen a renaissance as the business center of the Bay Area. Jobs that moved out to the suburbs during the auto age have moved back into San Francisco, so that employees can take advantage of its position at the center of a web of electric-powered public transit. The piers at the southeast port are humming with barges and coastal freighters. They take advantage of the revitalized rail facility nearby to offload food and other non-containerized cargo for transshipping to the south or distribution inside San Francisco. Container shipping still uses the Port of Oakland.

There is much less activity at San Francisco airport than formerly, because flying is expensive, and because the California High Speed Rail system has been operational for many years, eliminating the 30% of the Bay Area air travel that used to be devoted to intrastate city-hopping. Construction of a national high speed rail system is underway and will interconnect with the California system in a few years. Fewer private individuals can afford to fly, and businesses make use of electronic communications more than ever to limit the need for costly travel.

Do we know that this is the look of San Francisco's future? Of course not. This is an optimistic vision assembled by the Task Force, assuming that the City moves ahead soon on the basic recommendations of this report, and assuming that the world at large wakes up to the problem and takes needed action. This outlook could be wrong in many aspects, but in some ways, we are confident that it is a close approximation of what the future holds. We are certain that energy will be more expensive and less available in the future, and that the future will not look like a continuation of the past. We are certain that the City needs to make fundamental changes in its ways of using energy. Finally, we are confident in the ability of the people of San Francisco to persevere in the face of whatever the future holds for them.

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### **APPENDIX I**

#### **Members of the Task Force:**

##### **Jeanne-Marie Rosenmeier, Chair**

Jeanne-Marie Rosenmeier is a self-employed CPA, who has lived and worked in the Bay Area since 1982. She is active in San Francisco Oil Awareness and San Francisco Post-Carbon, and was a founding member of Diablo Post-Carbon. In 2002, she was the Green Party candidate for California State Treasurer. Her interests focus on the economic and social consequences of the inability of oil supply to expand to meet demand, as well as the interaction between the limits to oil production and climate change. Her undergraduate degree is in mathematics, and she received an MBA from the University of Chicago in 1975.

##### **Bernard Meyerson, Vice Chair**

Bernie is Vice President and co-owner of East Bay Resources, Inc., a 20-year old recyclable paper brokerage. Since 1971 he has been a waste and recyclables management consultant to local, state, national, and international clients. He has lectured and given classes at UC Berkeley Extension and San Francisco State. Prior to 1971 he had a 14-year career in International Higher Education in New York City and the University of Illinois. He holds a BA and MA in Political Science and International Relations.

##### **Patricia Gerber**

Patricia Gerber is a San Francisco author and cartoonist. A life-long environmentalist, she has been active in the anti-war movement since 2002 and remains a member of numerous local and national peace groups. She studied architecture with Paolo Soleri and received a Master of Liberal Arts from Johns Hopkins University in 1979.

##### **Woody Hastings**

Woody Hastings is an environmental professional with over twenty years of experience in community organizing, strategic planning, policy analysis, government relations, media outreach, and project management. Energy-related projects Woody has worked on include solar photovoltaic installations, a landfill gas-to-energy project, alternative fuel vehicle policy, a solar/hydrogen technology demonstration project, and leading a campaign to defeat an oil pipeline. Woody first became concerned about global oil supply limitations on his arrival to California in 1979 to find cars lined up waiting for gas. Woody holds a degree in Environmental Sustainability and Social Justice from San Francisco State University.

##### **Ben Lowe**

Benjamin Lowe is a researcher and advocate focusing on issues of regional transportation. He has worked on a range of transit projects, working with the Transportation and Land Use Coalition (now TransForm) on a report about the benefits of encouraging school children to walk and bicycle to school, and also served as Treasurer and Marin County Grassroots Organizer for the

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North Bay Transportation Alliance, a campaign to secure funding for the Sonoma-Marín Area Rail Transit (SMART) commuter rail program. Mr. Lowe has also worked on a number of Federal, state, and local emergency management and homeland security projects. For instance, Mr. Lowe helped to draft the Los Angeles Neighborhood Council Emergency Preparedness Plan, and served on the support staff for the Department of Homeland Security team tasked with the National Infrastructure Protection Plan, which outlines Federal policies for protecting U.S. infrastructure from natural disasters, catastrophic failure, and terrorist attack.

### **Jason Mark**

Jason Mark is an author, activist, and urban farmer committed to creating a more ecologically sustainable San Francisco. Mark co-manages Alemany Farm, the City's largest food production site. Alemany Farm uses organic food production to grow green job for low-income communities and promote neighborhood food security. Mark is also the co-author, (with Kevin Danaher and Shannon Biggs) of the book *Building the Green Economy: Success Stories from the Grassroots* (PoliPointPress). He edits the environmental quarterly magazine *Earth Island Journal*. His writings on the environment have appeared in *The Nation*, *Orion*, *E, Yes!* *The San Francisco Chronicle*, *Alternet.org*, *Grist.org*, and *TomPaine.org*.

### **Cal Simone**

Cal Simone is a writer, speaker, coach, and teacher influenced by Carl Jung. He began his involvement with Bay area peak oil groups in 2005 as the East Bay post carbon group's first speaker, talking on "Consumerism at the End of the Oil Age" and the societal and psychological implications of a post-peak collapse, and has been writing and speaking about it ever since. His writings on peak oil and a variety of other topics have appeared in *Culture Change Letter*, the *ManKind Project Journal*, and *Open Exchange* magazine. Cal is also active in a men's leadership group that develops and practices cutting-edge methods of governance and collaborative decision-making in groups. Earlier in his life, Cal was a music producer and founded an award-winning Macintosh software company that helped publishing clients automate mundane repetitive tasks.

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## **APPENDIX II**

### **Oil Producing Countries Past Peak, with Date of Peak:**

Mexico	2004
Denmark	2004
USA, natural gas liquids	2002
Yemen	2001
Norway	2001
Oman	2001
Australia	2000

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United Kingdom	1999
Ecuador	1999
Colombia	1999
Venezuela	1998
Argentina	1998
Malaysia	1997
Gabon	1997
Syria	1995
India	1995
Egypt	1993
Alaska	1989
Indonesia	1977
Romania	1976
Canada (conventional)	1974
USA, lower 48	1971
Texas	1971
Germany	1967
Austria	1955

### Non-OPEC Countries Not Yet at Peak:

Vietnam  
Thailand  
Equatorial Guinea  
Sudan  
Chad  
Brazil  
Angola  
China

Source: *Energy Watch Group* [http://www.energywatchgroup.org/fileadmin/global/pdf/2008-02\\_EWG\\_Oil\\_Report\\_updated.pdf](http://www.energywatchgroup.org/fileadmin/global/pdf/2008-02_EWG_Oil_Report_updated.pdf)

<sup>i</sup> Appendix C - San Francisco Peak Oil Preparedness Founding Resolution:  
<http://www.sfgov.org/site/uploadedfiles/bdsupvrs/resolutions07/r0268-07.pdf>

<sup>ii</sup> Multiple Sources: Hetch-Hetchy, Hetch-Hetchy Brochure; Natural gas-fired electricity, Electric Resource Investment Strategy (ERIS) Figure 4.3; Diesel fueled electricity, ERIS, Figure 4.3; Co-generation of electricity, SF Climate Action Plan update, 2005 Data; PG&E electricity, Total PG&E is calculated from net of uses vs. other sources of electricity: Natural gas, large hydro, coal, small hydro-powered, wind, nuclear, geothermal, all from PG&E

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2007 Power Mix; Solar, SF Solar Map; Natural gas calculated based on output figures; Petroleum-based fuel calculated based on 2005 VMT data from SF Climate Action Plan

iii Multiple sources: Electricity for residential, commercial, industrial, City Depts, Muni & BART was from the SF Climate Action Plan 2005 update; Solar, SF Solar Map; Hetch-Hetchy power sold calculated from Hetch-Hetchy total generated, less power used by City Depts and Muni; Electricity conversion losses estimated in inputs; Residential, commercial, and City Depts natural gas, SF Climate Action Plan 2005 update; Gasoline & Diesel trips within SF based on vehicle miles traveled data in Climate Action Plan 2005 update; Trips partly in SF, Caltrain, and ferries, Climate Action Plan 2005 update

iv CA Energy Balances Database and 2000 Energy Flow Chart: [http://www.lbl.gov/Science-Articles/Archive/sabl/2005/November/Cal-Energy-Balance\\_Murtishaw.pdf](http://www.lbl.gov/Science-Articles/Archive/sabl/2005/November/Cal-Energy-Balance_Murtishaw.pdf)

v CEC Energy Consumption Data Management System: <http://ecdms.energy.ca.gov/elecbycounty.asp>

vi SF Electricity Resource Plan, page 27

vii A kilowatt is 1,000 watts. A kilowatt-hour (kWh) is equal to a 1000 watt appliance operating for 1 hour

viii Phone Conversation with SFPUC Staff Camron Samii and Jim Hendry 1/14/09

ix CA Energy Balances Database and 2000 Energy Flow Chart

x PG&E Website: <http://www.pge.com/about/company/profile/>

xi PG&E 2007 Power Mix <http://www.pge.com/myhome/edusafety/systemworks/electric/energymix/>

xii Phone conversation with SFPUC staff Camron Samii and Jim Hendry 1/14/09

xiii Information provided by Hetch Hetchy Enterprise staff William Gibson via email 2/3/09

xiv The Raker Act is the 1913 federal legislation that authorized damming the Tuolumne River in Yosemite

National Park

xv CEC Energy Consumption Data Management System: <http://ecdms.energy.ca.gov/gasbycounty.asp>; A therm is 100,000 British Thermal Units, the equivalent of burning about 100 cubic feet of gas, and equivalent to about 29kWh of electrical power: <http://en.wikipedia.org/wiki/Therm>

xvi See Trans bay Cable Project Website: <http://www.transbaycable.com/>

xvii High Noon for Natural Gas, Julian Darley 2004

xviii US Dept. of Energy, The Smart Grid: An Introduction

[http://www.oe.energy.gov/DocumentsandMedia/DOE\\_SG\\_Book\\_Single\\_Pages.pdf](http://www.oe.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages.pdf)

xix Resolution 081562: [http://muni.sfgov.org/site/bdsupvrs\\_page.asp?id=94692](http://muni.sfgov.org/site/bdsupvrs_page.asp?id=94692)

xx San Francisco CCA Program Description and Revenue Bond Action Plan, Page 5

xxi CPUC Press Release 2/14/08: [http://docs.cpuc.ca.gov/PUBLISHED/NEWS\\_RELEASE/78824.htm](http://docs.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/78824.htm)

xxii PG&E Feed-in Tariff FAQ:

[http://www.pge.com/includes/docs/pdfs/b2b/wholesaleelectricssolicitation/Feedin\\_Tariffs\\_FAQs.pdf](http://www.pge.com/includes/docs/pdfs/b2b/wholesaleelectricssolicitation/Feedin_Tariffs_FAQs.pdf)

xxiii SF Dept. of Env. 2007 Cogeneration Study:

[www.sfenvironment.org/downloads/library/ciscocogenerationreportpdf.pdf](http://www.sfenvironment.org/downloads/library/ciscocogenerationreportpdf.pdf)

xxiv "The Potential for Solar Electricity Generation in San Francisco, A Report to the Environmental Law and Justice Clinic of Golden Gate University Law School.", by Karina Garbesi, Pd.D. and Emily Bartholomew, June 1, 2001

xxv *ibid*

xxvi Phone conversation with SF Dept. of Environment staff, Johanna Partin 1/5/09

xxvii CPUC Solar Hot Water Program: [http://www.cpuc.ca.gov/PUC/energy/Solar/080220\\_SD\\_SolarPilot.htm](http://www.cpuc.ca.gov/PUC/energy/Solar/080220_SD_SolarPilot.htm)

xxviii Phone conversation with SF Dept. of Env. staff Johanna Partin 1/05/09

xxix Phone conversation with SF Dept. of Environment staff, Cal Broomhead 12/8/08

xxx SF Bay Guardian 6/27/07

xxxi For further info see Marine Current Turbines website: <http://www.marineturbines.com/21/technology/>

xxxii Phone conversation with SF Dept. of Env. staff Johanna Partin 1/05/09

xxxiii *ibid.*

xxxiv Assessing California's Offshore Wind Potential, Dvorak, et al, April 2008:

<http://www.image.ucar.edu/public/TOY/2008/focus4/Presentations/TALKDvorak.pdf>

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- xxxvi 10/6/08 US DoE News Release: [http://apps1.eere.energy.gov/news/news\\_detail.cfm/news\\_id=12019](http://apps1.eere.energy.gov/news/news_detail.cfm/news_id=12019)
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[http://sfenvironment.org/downloads/library/1\\_planreviseddecember2002pdf.pdf](http://sfenvironment.org/downloads/library/1_planreviseddecember2002pdf.pdf)
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- li <sup>12</sup> “Growing it Alone,” by Jason Mark. *Earth Island Journal*, Spring 2007.  
[http://www.earthisland.org/journal/index.php/eij/article/growing\\_it\\_alone/](http://www.earthisland.org/journal/index.php/eij/article/growing_it_alone/)
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- lv <sup>16</sup> Conversation with Amy Franchesini. Visit <http://www.futurefarmers.com/victorygardens/> for more information.
- lvi <sup>17</sup> Participants at Peak Oil Food Security Charette
- Jason Mark, Task Force Member, co-manager, Alemany Farm  
 Jessie Woletz, Earth Share of CA  
 Mei Ling Hui, SF Environment  
 Antonio Roman-Alcala, co-manager, Alemany Farm  
 Blair Randall, director, Garden for the Environment  
 Richard Katz, Task Force Member  
 Jeanne Rosenmeier, Chair, Peak Oil Task Force  
 David Pascal, SF Environment and Mayor Gavin Newsom’s Office

# SAN FRANCISCO PEAK OIL PREPAREDNESS TASK FORCE

## REPORT

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Paula Jones, San Francisco Food Systems, Dept of Public Health  
 Chris Cook, author and journalist, Diet for a Dead Planet  
 Erica Etelson, member, Berkeley Peak Oil Task Force  
 Andrea Jadwin, co-director, SF Garden Resource Organization (SFGRO)  
 John Bela, San Francisco Victory Gardens  
 Kevin Bayuk, Urban Alliance for Sustainability and SF Permaculture Guild  
 Julia Brashares, San Francisco Parks Trust

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<sup>lviii</sup> Metropolitan Transportation Commission 2035 Regional Transportation Plan.

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<sup>lxiii</sup> SFMTA Short Range Transit Plan 2007 – 2027, p. 129.

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lxxi It is impossible to predict with certainty how quickly the oil price climb will play out, but it is possible that within the next 10 years we may be at the point where the following conditions could come to pass:

a. People can't afford to fill their gas tanks for their non-essential needs (convenience and elective activities and purchases). This needs to be addressed in a relatively wealthy city where people have come to expect certain entitlements.

b. People can't afford to fill their gas tanks for their more essential driving needs.

c. Rising fuel prices makes food more expensive to produce and therefore less affordable.

d. Truckers can no longer afford to deliver as much food and goods to retail stores in the city.

e. A growing number of people can no longer afford to drive into or out of the city on a day-to-day basis for their jobs.

f. The economy is affected to the point where there is high unemployment.

g. People start to understand that there is no viable alternative to oil, and when they see that this is not a temporary crisis but a long-term and progressively worsening problem.

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