

Assessment

Buildings account for approximately half of San Francisco's energy usage. They shelter us from the elements and convey the water, light, electricity, and other services on which we rely. They are integral to our lives and provide us with comfort and security.

In their current state, San Francisco's buildings will not serve us well as hydrocarbon energy becomes scarce, increasingly expensive, and occasionally unobtainable. There are numerous reasons for this. Developers maximize profits by focusing on delivering marketable square footage at the lowest possible cost, without regard to the life cycle performance of their buildings. Financiers also tend to be concerned with a project's cost, to the exclusion of other factors. Architects earn fees that do not depend on whether their designs are green. Sales and leasing agents receive commissions that are determined by the dollar amounts of the contracts they deliver. Engineers use standards that, while they are currently being updated, do not yet deliver admirable energy savings. Maintenance specialists are rewarded for keeping equipment operating, not for operating the equipment to manage energy as well as possible. Building owners cannot always separate energy costs from other operating costs. Appraisers lack metrics for valuing a structure's energy efficiency. Tenants place energy consumption near the bottom of their lists of attributes when deciding which properties to lease.

Sustainability considerations have historically been left out of the equation, as all parties have either prioritized short-term results over long-term considerations or discounted the importance of total building performance. This worked acceptably as long as energy was abundant and cheap. However, it will prove to be a liability in the post-peak era.

The recent trend in the real estate industry toward promoting "green" buildings has been aimed at achieving the PR benefits that improve a building's marketability, but this step does not necessarily deliver improved energy performance.

Impact & Vulnerability

Our ability to conduct our indoor lives, along with our capacity to operate refrigerators, computers, and the other necessities and conveniences of modern life, will decrease in times of limited energy. Yet we will want to continue to avail ourselves of as much of the first-world lifestyle we currently enjoy as possible for as long as possible. If we improve our buildings now, we will be better able to do this in the future and our lives will be more sustainable, fuller, and richer.

Since the dawn of the peak oil age is now upon us, we should anticipate that the costs and difficulty of replacing our built environment will increase. This means that we will live with our existing building stock for a longer period of time than was anticipated at the time it was constructed.

The “business as usual” model is not a useful guide for planning to cope with low-energy scenarios. It assumes that the costs of improving our built environment are too high to be worthwhile. However, continually escalating energy prices alter that analysis; every dollar we now invest in demand destruction will have a shorter payback period and a higher rate of return. Additionally, the costs of energy-saving, energy-generating, and energy-obviating measures have been falling. The “business as usual” bias also fails to acknowledge the likelihood of occasional unavailability of fossil fuels, in which circumstance our comfort and ability to function at a high level will be compromised in proportion to how well all of the city's components – its transportation system, infrastructure, economy, societal functions, built environment, and others – continue to perform without fossil fuel inputs.

The issue of costs also raises the question, “Cost to whom?” Buildings have been the longest-lived of humankind's creations to date*, and they are likely to be the longest-lived part of the legacy we leave to those who will outlive us and those who will come after them. Since this Task Force's mandate requires us to address the future, we cannot dismiss the impact that a failure to invest in upgrading our built environment will have on San Franciscans who follow us. The dollar cost of doing so may seem high today, but the results will be invaluable tomorrow.

Availability of the money, materials, and energy needed to make improvements have already started to diminish, and it is widely presumed throughout peak oil literature that the rate of their disappearance will increase over time. Thus our ability to upgrade our built environment will be decreasing while our desire for the benefits that we would derive from such an effort will be increasing. Therefore, smart risk management dictates that we cannot start improving the energy performance of our buildings soon enough.

If San Francisco is to become a leader in modernizing its built environment to withstand the challenges of the post-peak era, we will need to “Go big, go fast,” to use the words of the City of Portland (Oregon) Peak Oil Task Force.

*Freeways may prove to be more durable. We will know with certainty a few millennia from now.

Goals & Strategies

The goal of equipping our buildings to better withstand peak oil exigencies is to allow San Franciscans to live as well as possible in an energy-constrained environment. It is foreseeable that as we continue to transition into the post-peak age, there will be occasional times when San Franciscans will have no energy other than whatever we manufacture ourselves. The ability to generate electricity without the use of fossil fuels, by using solar gain, wind, or other renewable resources, will not only allow us to provide light, cook food, run computers, and otherwise enjoy our living and working spaces, but also grant us greater potential for operating transportation systems, maintaining communications networks, and otherwise enriching our lives above the level of mere subsistence. It will also increase our ability to run a local economy. “Energy is economy” is an axiom in the peak oil community; without energy, our economy will grind to a halt.

We recognize that better buildings cost more. The question is whether we should view that cost 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 our quality of life when energy is scarce. If we do not invest in improved buildings now, while we have the option of doing so, the opportunity may be lost as money, materials, and energy become less plentiful. In addition, as energy prices escalate through the post-peak years, the payback period for improvements will become shorter and the ultimate value of the investment will increase.

The improvements we recommend cannot be achieved if we continue to practice “business as usual.” The familiar paradigm may be convenient, but when we remember that it has given us climate change, deforestation, water pollution, topsoil depletion, acid rain, species extinction, chemical contamination, ecosystem destruction, and a host of other ills, we question the wisdom of continuing to be guided by it.

First and foremost, since there will be times when the only energy we will have is the energy that we generate ourselves, we should prioritize outfitting our buildings with equipment that generates electricity without burning fossil fuels, by using solar gain, wind, or other renewable resources. In a built-out city such as ours, existing structures provide the optimal locations for siting such equipment.

We would also be wise to prioritize energy performance when evaluating proposals for new development and to retrofit existing buildings so that they will remain highly useful when hydrocarbon energy becomes rare and expensive. In this regard, we will be best served by standards that are dynamic and adaptive rather than prescriptive, continually monitored, and revised on an on-going basis as a result of lessons learned to yield superior performance.

Among today’s carbonless technologies, the one that is generally thought to provide the highest return for every dollar of investment is solar hot water. 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. Therefore, equipment that uses solar gain to create electricity should be granted higher priority. The Mayor’s effort to bring more solar generating capacity to San Francisco is a step in the right direction, and the Mayor’s Task Force on Solar Energy is currently evaluating the best options for accomplishing this.

*The City of Portland (Oregon) Peak Oil Task Force report, titled *Descending the Oil Peak: Navigating the Transition from Oil and Natural Gas*, recommended preventing infrastructure investments that would not be prudent given fuel shortages and higher prices (page 43). The same holds true of buildings. Therefore, San Francisco should require that all new development have independent*

capacity to power all of its systems and plug loads. To increase the future usefulness of existing structures, we should retrofit them for improved energy performance.

To allow potential renters or buyers of properties to make fair 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.

Recommendation: The City and County of San Francisco should require that all new development be energy-positive.

“Energy hasn’t been as big an issue as it needs to be. We weren’t preserving energy.” Phil Williams, Vice-President of local construction giant Webcor, quoted in the September 16, 2008 edition of the San Francisco Examiner, page 5

“The goal of achieving significant levels of construction of cost-effective residential zero energy buildings (ZEB) – buildings that use no fossil fuels – by 2020 is feasible, except in hot, humid climates. Most of the required technology to compete with traditional housing is available, but inadequately demonstrated” American Physical Society report titled “Think Efficiency”

“Energy-positive buildings” 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. The new Reichstag (parliament building) in Berlin is one example of an energy-positive building. Several European, Asian, and Middle Eastern nations currently lead the United States in efforts to have their buildings achieve energy-positive status.

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 generating capacity to (1) account for the amount of energy it requires for its operation and (2) manufacture excess energy to feed into the grid. Since diesel motors and other generators that rely on hydrocarbon inputs will not be useful when fossil fuels are unavailable, reliance on them is unadvisable. Instead, the sensible choices are solar, wind, and other renewable forms of generation.

Because our city is densely developed, most of the best places to site new generating capacity are on buildings. However, it is not always possible to provide sufficient on-site facilities, so it may be necessary to allow some developers to site their building’s compensating electricity generation at another location within the city limits.

The State of California will require new buildings to be energy-positive starting in 2020. We recommend that the City and County of San Francisco require this earlier.

Recommendation: Retrofit existing building stock for better energy performance.

“It is inconceivable that in a market economy, such large and profitable savings would remain untapped. But to a practitioner who knows how buildings are created and run, it is not only conceivable but obvious.” - Amory Lovins

“At REgrid Power they are offering a solar loan option over a 15-, 20- or 25-year term. It guarantees that people's solar bill will be less than their current electric bill. So if they are paying \$100 monthly for electricity, they can save \$20 or more with the solar financing program,”

“Former President Bill Clinton today announced the creation of a \$5 billion global effort to fight global warming by retrofitting existing buildings with more energy efficient products... [to] ... provide both cities and their private building owners with access to the necessary funds to retrofit existing buildings with more energy efficient products, which is expected to produce energy savings of between 20 and 50 percent.”

In San Francisco as elsewhere, there are more existing buildings than new ones. If we are to achieve the sort of energy independence that will serve us well in the post-carbon era, we will need to retrofit our existing buildings for high energy performance, by reducing the amount of energy they consume, adding generating equipment, or both. The difficult question is how to finance these upgrades.

Owners who occupy their properties have more options than renters. They can pay for their retrofits out of the resulting savings in several ways. Purchasers can obtain a “green mortgage,” a type of loan that takes into account the fact that people who pay lower utility bills keep more money for themselves and therefore are more creditworthy; such loans cover the cost of the improvements as well as the building’s purchase price. Berkeley recently created a solar assessment district, which allows the city to finance the cost of solar panels for homeowners, who make repayments through their property taxes over a 20-year period; San Francisco would be wise to follow suit. Several solar leasing companies offer programs that allow owners to enjoy the benefits of solar photovoltaic panels without bearing the cost of purchasing them. Fireman’s Fund Offers “green insurance” that makes retrofits more affordable.

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 our climate) would cost its owner less than \$6,000 out of pocket. This expenditure would be quickly recouped and after that, savings would accrue every month.

However, 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 likely to be solved by market forces – or not solved quickly enough – can be resolved only by government action. Therefore, we recommend that San Francisco abandon the “business as usual” approach by requiring that aggressive steps toward retrofitting existing buildings be taken.

While on the campaign trail, President-elect Obama spoke of spending \$150 billion over the next decade to improve our nation’s energy efficiency and create five million jobs. Among the projects he mentioned is a proposal to make one million units per year more energy efficient. We hope that San Francisco will be able to participate in any such new programs and direct its share of federal monies, in part, to improving the homes of renters, especially those occupied by economically vulnerable families.

Recommendation: Update San Francisco's Green Building Ordinance.

“Although the deployment of the LEED Standard has raised awareness of Green Building practices, its scoring system is skewed toward the ongoing use of fossil fuels. More than half of the available points in the Standard support efficient use of fossil fuels, while only a handful are awarded for the use of sustainable energy sources. Further the USGBC has stated support for the 2030 Challenge, an effort that has set a goal of efficient fossil fuel use by 2030.”

www.wikipedia.org

“Recent studies have found that as many as 30% of LEED platinum buildings perform no better than conventional buildings.” www.newbuildings.org

“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.”

Basically, the current green and sustainability craze can be summed up as architects and engineers behaving badly. The good news is that most of this nonsense can be easily remedied when adults finally get involved.

“Energy Plus is set to consume only 16 kilowatts of energy per square meter, a whole lot less than the 80 to 250 so common among traditional office buildings.”

... it now takes 90,000 BTUs a square foot to run the average building for a year, but this can be reduced to 40,000 or even 35,000 if the latest building technologies are applied.

The City and County of San Francisco recently adopted a Green Building Ordinance that focuses on climate change, as do all of the similar ordinances that have been adopted in other jurisdictions. This is a forward-thinking step, but it does little to address peak oil concerns, which require giving foremost consideration to a building's energy use. We recommend that SF become the first city in the nation to strengthen its requirements to higher peak oil standards. To bring the current ordinance up the level that peak oil mitigation requires, several changes would be necessary.

The current law relies heavily on Leadership in Energy and Environmental Design (LEED) evaluations as a major criterion for determining whether a building meets the new green standards. However, LEED does not address itself to peak oil concerns. It incentivizes a checklist rather than encouraging integrative planning. This encourages pointmongering rather than pushing developers to choose as green a building as possible. Its points are not weighted, though some provide greater benefit than others. It caps innovation at four points, thereby limiting creative problem-solving. As a result, LEED misses opportunities and falls short of what is possible. Most importantly, LEED does not emphasize a project's energy performance.

As part of updating the Green Building Ordinance to replace the use of LEED as a criterion with performance-based evaluations, we recommend requiring audits to evaluate the actual energy performance of buildings after they are in operation and publishing their results. Among other benefits, this would provide the sort of reality-based feedback that we will need if we are to improve future versions of San Francisco's green building requirements.

When the City Office of Economic Analysis issued its 17 September 2007 evaluation of the initial draft of the Green Building Ordinance, titled *Green Building Construction Requirements: Economic Impact Report*, it determined that “38% of all annual construction activity in the city would be covered under the proposed ordinance” (page 10). The final version of the bill exempts so-called “laboratory” buildings, effectively removing the Mission Bay projects from any green building requirements. It is

not possible at this time to know with certainty how much this will decrease the percentage that falls under the ordinance's provisions. Buildings that are not independently sustainable will not be optimally useful in the post-carbon era. Therefore, we should strive to have fewer of them in San Francisco. To achieve this, all new projects should be covered by our green building requirements.

We further recommend creating dynamic standards that incorporate new inventions and techniques as they become available and are tested. Our green standards should be monitored continually and, as a result of lessons learned, evolve to generate ever-better energy savings.

[Laundry list of specifics to be listed in an appendix.]

Recommendation: Adopt best practices from other jurisdictions.

“All new homes built in Germany after 2008 will be required to install renewable energy heating systems, and after 2010 the remaining houses will have to add them as retrofits.”

Several forward-thinking approaches to raising the caliber of the built environment have been adopted or proposed in other jurisdictions. We recommend that the City and County of San Francisco draw inspiration from the following and emulate or improve on them:

Austin’s Homes and Buildings Plan mandates that new single family homes be zero net-energy capable by 2015. It further requires a 75% increase in energy efficiency in all new construction by 2015 and disclosure of a property’s energy use history at the time of sale. Their Energy Efficiency Retrofit Task Force meets bi-weekly.

Dekalb County, Georgia, will no longer hook up water service to newly sold homes that do not have low flow toilets. Since water flow and energy usage are intricately linked, San Francisco could refuse to hook up water and sewer services to any structure that does not contain waterless toilets (*or waterless urinals and dual-flush toilets?*) and have a greywater system.

Albuquerque and Santa Fe have adopted the Architecture 2030 challenge, which calls for buildings to use no fossil fuels for their operation by the year 2030. They also have Green Code Committees.

West Hollywood’s new development standards apply to all proposals, including remodels and tenant improvements as well as new construction.

In Los Angeles, Mayor Villaraigosa has proposed using city-controlled redevelopment funds to lure renewable energy enterprises to his city.

Throughout Germany, the development community has long understood the importance of requiring that solar photovoltaic (pv) systems be installed on all new construction. In Marburg, an ordinance further requires that pv be installed on existing buildings when their roofs or heating systems are replaced. Marburg city officials not only faced down resistance on the part of some property owners, but gave the law force by including a fine of 1,000 euro for those who do not comply. In San Francisco, we would be wise to lengthen the list of improvements that trigger a requirement for *upgrading* to include any extension or addition to be attached to an existing building and any rehabilitation of an existing structure whose value exceeds 10% of the property’s pre-improvement value. We should also ensure that compliance will be less costly than non-compliance.

Switzerland is discussing mandating that a portion of the total cost of any renovation, perhaps 18%, be spent on improving the energy efficiency of the buildings. This is projected to save a minimum of 15% of the building’s energy requirement.

In France, all transfers of title must be accompanied by an energy performance audit.

United Kingdom’s Foresight group is working on a plan to require annual energy audits of buildings.

England and Wales have required that developers provide “Energy Labels” for all new homes since January 1, 2001. These publicly inform buyers and renters of a structure’s energy fitness.

The Vatican has already installed solar panels on one of its buildings.

In Chicago, tenants are (*were?*) allowed to withhold one-half on one month’s rent that they can then spend on improvements of their choice. By itself, adopting this would not move us forward enough, but it does point the way toward retrofitting our building stock. We urge the City to pass additional means of ensuring that rental properties are brought up to the highest level of energy performance.