DOE/CH10093-256 DE94000234
December 1993

Tomorrow's Energy Today for Cities and Counties: Solar Access: A Winning Strategy[1]

U.S. Department of Energy[2]

A local government's decision to protect solar access--a building's access to incoming sunlight--can have far-reaching benefits for developers, home buyers, and the community.

Economic and environmental concerns are causing a renewed interest in solar access protection for new housing. "Using solar energy cost-effectively offers benefits to home buyers, builders, developers, and the community as a whole," says Mary Tucker of the Environmental Services Department, City of San Juan, California. "But there's not much point in encouraging the use of solar in building if future access to the sun can be blocked by new construction or trees."

At the direction of the San Jose City Council, the Environmental Services Department conducted extensive research on the costs and benefits of adopting solar access guidelines. "Our research," according to Ms. Tucker, "indicates that after 10 years of implementation, solar access design guidelines--in the tenth year alone, based on current trends--could save nearly 24 million kWh (81 billion Btu) of energy. This would reduce residential energy bills by $840,000 (in 1991 dollars) and eliminate nearly 5500 tons of carbon dioxide emissions." Numbers like these convinced the San Jose City Council to adopt solar access design guidelines in December 1992.

The definition of solar access varies slightly from one jurisdiction to another. In San Jose, for instance, solar access is defined as the unobstructed availability of direct sunlight at solar noon on December 21. In Boulder, Colorado, sunlight must not be obstructed between 10 a.m. and 2 p.m. on December 21. Various definitions specify the percentage of wall area, glazing, or roof that can be shaded by buildings or mature vegetation and still be considered to have adequate solar access. However, some guidelines allow "solar friendly vegetation," such as deciduous trees with branching patterns that allow a maximum amount of winter sunlight to reach the building. (See Figure 1 for an example of a solar oriented subdivision. The streets are designed to slant within 30 degrees of the true east-west axis, which minimizes shadows on houses.)

IMPORTANCE OF SOLAR ACCESS PROTECTION

Protecting solar access is not a new concept. The Roman Empire had solar access laws, and the Doctrine of Ancient Lights protected landowners' rights to light in nineteenth-century Britain. Several dozen U.S. communities adopted solar access regulations in the 1970s and early 1980s in response to the energy crisis, and many others are considering solar access protection in the 1990s as a way to reduce air pollution and save money.

In addition to creating a receptive environment for solar building technologies protecting solar access helps to keep money in the community. Input/output analyses demonstrate that each $1.00 spent to acquire energy resources from outside a community generates only about $0.33 of economic activity within the community. On the other hand, each $1.00 spent within the community produces, through the

1. This document is DOE/CH10093-256 DE94000234, from the series Tomorrow's Energy Today for Cities and Counties produced for the U.S. Department of Energy. Publication date: December 1993.
2. This document was produced for the U.S. Department of Energy (DOE) by the National Renewable Energy Laboratory, a DOE national laboratory. The document was produced by the Technical Information Program, under the DOE Office of Energy Efficiency and Renewable Energy.

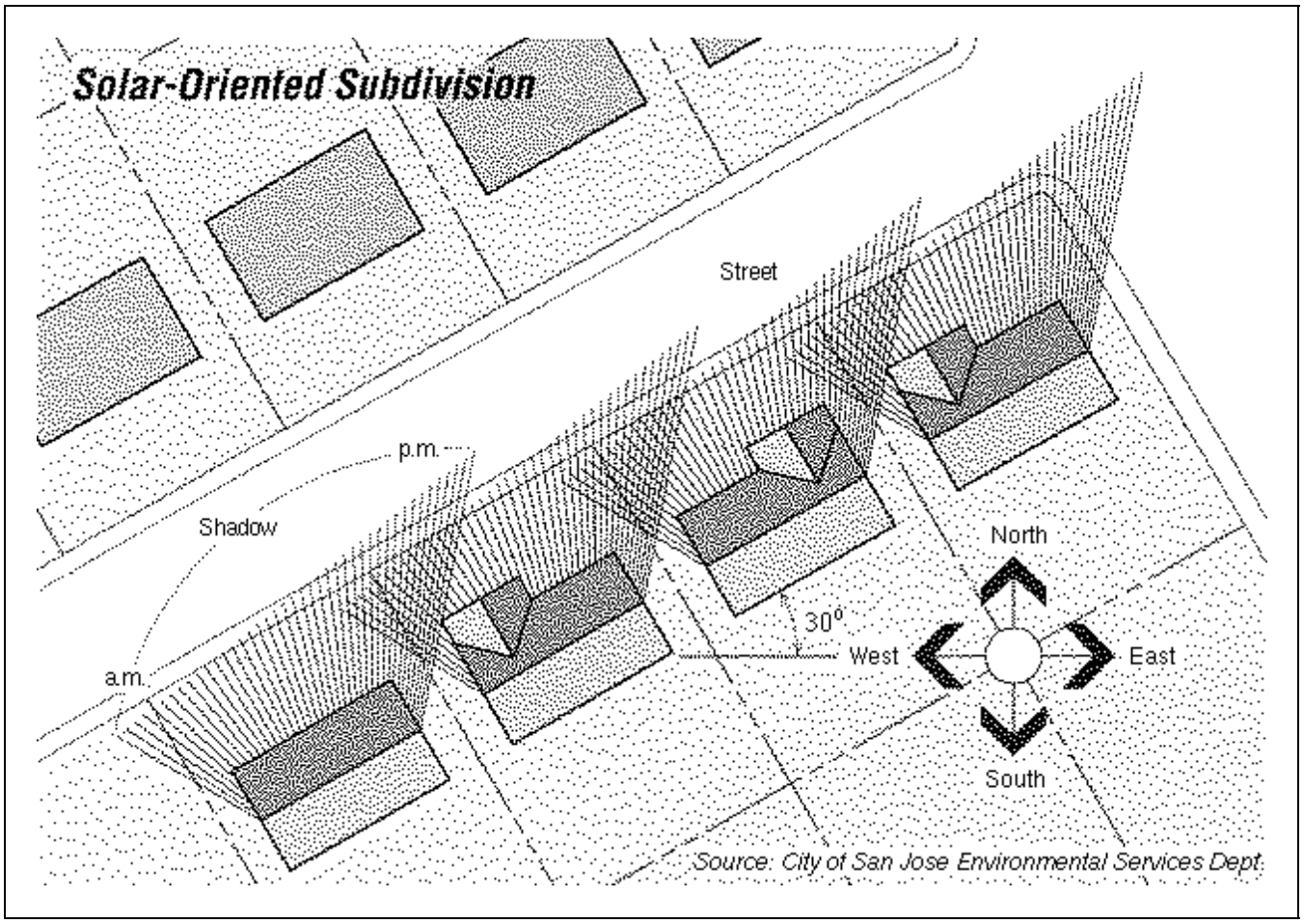

Figure 1. Shadow Distribution Pattern in a Solar Oriented Subdivision.

economic "multiplier effect," about $1.67 of local economic activity.

The multiplier effect of investment in solar and energy-efficient technologies increases local economic activity in three ways. First, local businesses that sell solar and energy-conserving goods and services benefit directly. Second, a regenerative cycle is created when funds realized through energy savings are reinvested in energy businesses. Third, lower utility bills for commercial and residential energy consumers result in increased profits and disposable income. With all three effects, much of the profit or money save will be spent locally.

COSTS OF SOLAR ACCESS PROTECTION

The costs of protecting solar access are an issue both for local governments and for builders and developers. Municipalities facing shrinking budgets can ill afford to adopt new regulations that will increase their costs. And successful builders and developers must always keep a close eye on their bottom lines.

Most of the cost to local governments in implementing solar access regulations come from extra staff time spent reviewing building plans and subdivision applications. As part of the Portland (Oregon)/Vancouver (Washington) Metro Area Solar Access Project, funded by the Bonneville Power Administration, researchers evaluated ordinances that had already been adopted to determine how much time and expense were involved in these reviews.

For existing lots, the solar access review took an average of about 10 extra minutes, representing a cost of approximately $3.50. For new developments designed using solar access guidelines, the solar access review per lot took an average of about 3.3 extra minutes at a cost of about $1.00. These figures were substantially lower than the researchers had anticipated.

Although opposition from building and development interests is predictable in any community considering solar access protection, evidence is mounting that these constituencies may actually benefit from the protection. "In the San Jose area, our research shows that simply orienting a building to the sun can reduce total energy requirements by 11% to 16.5%," Ms. Tucker explains. "If the buildings are designed correctly, the space cooling savings--up to 40%--are especially impressive." Solar orientation alone can reduce cooling system requirements by a ton or more of capacity. If solar orientation is applied to an entire development, the savings can be substantial.

In spite of developers' skepticism about the benefits of regulation, protecting solar access can actually reduce development costs. The California Energy Commission redesigned a proposed subdivision in Sacramento to optimize solar access. The solar plan had 7% more lots overall, 40% or more solar lots, and less street area than a conventional subdivision.

Researchers for the San Jose Solar Access Program conducted solar redesign case studies for single- and multifamily developments. In the single-family study, redesign resulted in the same number of lots, slightly reduced street dimensions, and proper solar orientation in 80% of the lots (compared with 46% in the original design). The multifamily development redesign achieved similar results: the number of units increased, the street lengths were reduced, and percent of units with good solar orientation increased from 38% to 91%.

In both of these examples, development amenities were maintained, development costs were actually reduced, and the number of dwellings with solar access dramatically increased.

UTILITIES GET INVOLVED

Utilities throughout the country are using solar technologies as demand- side management (DSM) measures. Sierra Pacific Power, the local utility in Reno, Nevada, is developing a DSM program designed to save natural gas. Sierra Pacific offers incentive payments to solar home builders to help offset the need for gas heating.

The Sacramento Municipal Utility District (SMUD) has implemented an ambitious program designed to accelerate the adoption of solar hot water systems in its residential service territory. The program includes bulk purchases by the utility and testing and performance monitoring of different systems. Other utilities use rebates or other incentives to encourage the use of solar hot water systems as DSM measures.

Some utilities are implementing programs to "rent" customers' rooftops for the installation of photovoltaic modules. New York Power Authority, for instance, is starting a lease program for photovoltaic applications. In many service areas, summer air-conditioning demand peaks in the afternoon, when the sun is high and photovoltaic systems are most efficient. In other areas, photovoltaics help power lighting systems or provide grid support.

None of these utility programs are viable without solar access protection.

IMPLEMENTING SOLAR ACCESS PROTECTION

Communities around the country use many different mechanisms to protect solar access. In San Jose, planners developed guidelines to encourage solar orientation in new construction. These Solar Site Design Guidelines, developed by the Environmental Services Department, specify that the long axis of new dwellings should face within 30 degrees west and 45 degrees east of true south.

Because houses in a subdivision usually face the street, planner sin San Jose found that the easiest way to achieve solar orientation was to orient the streets with 30 degrees of the true east-west axis. Homes in such a subdivision would have good solar orientation by default.

Other methods of protecting solar access include zoning ordinances, performance criteria, and restrictive covenants. Municipal adoption of any or all of these measures is contingent on local land-use patterns, the political situation, and the physical characteristics of the area. Another critical element of solar access protection is the provision of a redress mechanism that precludes costly and time-consuming legal processes.

Solar access can be mandatory or voluntary. Many jurisdictions find voluntary guidelines a good way to begin the process of educating builders, developers, and citizens about the benefits of solar access protection. After an evaluation period, during which stakeholders have an opportunity to provide input to local officials, mandatory guidelines can be adopted.

Because the San Jose Solar Access Guidelines are voluntary, the Environmental Services Department has developed workshops for architects, builders, developers,

and city staff to encourage exploration of the opportunities afforded by solar buildings with protected solar access. Free exchange of information between the local government officials and developers helps ensure that everyone concerned will reap the maximum benefit from solar access protection.

WHY IS SOLAR ACCESS PROTECTION NEEDED?

Without solar access protection, pursuing the benefits of solar technology may not be seen as viable. If the flow of sunlight is impinged, people are cut off from their energy supply. For example, solar technologies such as passive solar homes, solar hot water systems, and photovoltaic or solar electric panels provide opportunities to reduce the use of fossil fuels, decrease air pollution, and save money on energy.

Solar building technologies are becoming popular with utilities as components of demand-side management (DSM) programs. DSM use renewable energy and energy efficiency to reduce energy demand. The benefits to the utility include delaying or eliminating the need to build expensive new power plants. Public opinion strongly favors the use of renewables and energy efficiency. But without solar access protection, large potential users of the technology may be reluctant to use it.

Passive solar homes provide beautiful, comfortable, affordable living spaces while saving large amounts of energy and reducing pollution from local power plants. In some areas, solar hot water systems are also used as DSM measures to reduce electric energy use and peak demand for hot water. But utilities may be hesitant to endorse the use of solar technologies without solar access protection.

Paul Neuffer of Neuffer Construction Company, Inc., in Reno, Nevada, is one builder who has made solar design work for him. Nueffer offers three solar plans: a "sun-tempered" home, which reduces heating bills by 15% to 25% and does not add to construction costs; a "direct gain" model, which costs about $500 more to build than does a comparable conventional home for a heating cost reduction of 30% to 40%; and a fully "solar" house, which saves 70% of heating costs and results in about $1,500 in increased construction costs. Neuffer estimates that his sales have increased 30% because of the solar features in his homes. Without solar access protection, would buyers of Nueffer's homes be assured of achieving these significant energy savings?

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The City of San Jose conducts solar access workshops for architects, designers, and builders.

American Planning Association
1313 East 60th Street
Chicago, IL 60637
(312) 955-9100

Site Planning for Solar Access: The Guidebook for Residential Developers and Site Planners

Protecting Solar Access for Residential Development: The Guidebook for Planning Officials

Solar Design Review: A Manual on Architectural Controls and Solar Energy Use

Published in 1979, these three excellent volumes are now out of print, but are available of many libraries.

Urban Consortium Energy Task Force
Public Technology, Inc.
1301 Pennsylvania Avenue, NW
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The UCETF works extensively with local governments to document and help share their experiences and represents an excellent information and technical assistance resource.

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