

In Support of Local Solar Mandates

*Janice G. Hamrin**

I.

WHY LOCAL MANDATING

One of the most interesting and controversial issues currently confronting California local government is whether or not to mandate the use of solar energy technologies. In 1978 San Diego County became the first county to pass an ordinance which required the use of solar domestic water heating systems in all new houses constructed where natural gas was not available.¹ On October 1, 1980, the ordinance expanded to include areas with natural gas supplies.

This bold action has caught the attention of local officials throughout California, where battle lines have already been drawn between those supporting mandating and those opposing it. The supporters and opponents of solar mandates cannot be classified according to their business interests or their politics, for neither provides an accurate dividing line. Rather, supporters and opponents seem to take their stand based on whether or not they believe there is an energy problem (or potential energy problem) severe enough to justify this type of governmental action. This article will present the major political and substantive arguments supporting local solar mandates and outline the key elements of a successful implementation.

One of the problems associated with almost any discussion of "mandating" is that the word itself is so laden with emotion, and

* Janice G. Hamrin, Ph.D Ecology/Public Policy. Dr. Hamrin was the former Manager of Solar Programs for the California Energy Commission. She is now a consultant for renewable energy and conservation policy and design with Jan Hamrin Associates of Davis and Executive Director of the Alliance for Renewable Energy, a nonprofit corporation in Sacramento. Jan Hamrin also serves as the Governor's alternate representative to the Board of Directors of the Western Solar Utilization Network (WSUN).

1. San Diego County, Cal., Ordinance 5589 (Aug. 21, 1979). The ordinance added § 53.119 to the San Diego County Plumbing Code. It requires the use of solar water heating systems in new residential construction and became effective in October 1979.

stimulates such heated responses, that a discussion can seldom be limited to questions such as "mandate what, where, when, or in conjunction with what other actions?" This is very unfortunate because even with the discussion limited to solar mandates, each technology (active water heating, passive space conditioning, daylighting, industrial process heat) and each market sector (residential, commercial, industrial, new/existing, owner occupied, or leased) presents special circumstances which drastically affect any consideration of what is appropriate, necessary, effective, feasible, and/or possible. This article, in order to remain a manageable size, will focus only upon local government mandating of solar water heating for new residential construction. Some of the issues may be generalized to other technologies and/or market sectors, but each technology and market sector has a set of characteristics descriptive only of itself.

A. Why Mandate?

First, if the goal is to put solar technology in place as quickly as possible and at a fairly low cost to government (as compared to government's other major tool, incentive programs), then solar technology should be required by regulation.² The mandating of solar water heating in all new housing within a specified geographic area in which it is economically and technologically feasible will provide greater market penetration in a shorter time than will an incentive program.

Second, both regulatory and incentive programs must be conducted in conjunction with public information and training efforts. To achieve within the same time period the same impact with an incentive program as achieved with a regulatory program would require dynamic and expensive media advertising to inform and influence all the potential new home buyers to insist on solar water heating. With a regulatory program only builders need to be informed, and they can be informed fairly inexpensively through the permit process.

Third, the incentive provided by the 55 percent solar tax credit

2. An ordinance which mandates the use of solar technology is a form of regulation. It carries with it, however, a high risk of failure due to noncompliance and public backlash if it is not carefully structured and accompanied by a cluster of supporting policies and educational programs. For example, a backlash could result if insufficient care is given to providing for consumer protection as well as some form of consumer recourse in the event that systems fail. Also, care must be taken to adopt standards which encourage quality products and minimize the opportunities for fraud.

costs the California state government \$1320 for *each* \$2400 solar water heating system installed in the State, plus the costs of administering the program. A regulation requiring such systems is much less expensive and immediately affects the entire submarket targeted by the regulation.³

Fourth, whether solar hot water systems are promoted with incentives or by regulations, builder/developers, architects, and building inspectors must receive training in the use of solar technology. There must also be a sufficient number of installers available to properly install the systems. This professional training can be achieved more quickly with a regulatory program. It should be noted that if incentives are used to achieve the same results within the same time frame, the training requirements would be identical. However, because an incentive program would *not* try to operate within the same time frame as the mandate program, the mandate program provides a convenient mechanism for compressing the time frame for educational and training expenses.

Finally, it can be argued that we cannot afford the time required for "market mechanisms" to bring a new technology into widespread commercial use.⁴ We have neither the resources nor the political time to wait. Moreover, the energy field is already so controlled by outside forces that it is questionable how effective "market mechanisms" would be.

B. Why Mandate Solar?

Solar is currently a sexy political topic. A politician supporting solar legislation exhibits a public concern for energy problems as well as a public concern for the environment. At present, conservation is frequently viewed as less flashy, and surprisingly, can be harder to sell (either because it is so obvious, *i.e.*, "everyone must be doing it," or because the local government attitude is to let the State be responsible for conservation).

C. Why Solar Water Heating?

Politically, one of the advantages of focusing on solar hot water systems in promoting the use of solar energy is that the public can

3. Currently, both incentives and local regulations exist side by side. However, most incentive programs are scheduled to end by 1985, at which time it is hoped that both public demand and economics will make them no longer necessary.

4. See generally R. SOLO & E. ROGERS, *INDUCING TECHNOLOGICAL CHANGE FOR ECONOMIC GROWTH AND DEVELOPMENT* (1972). See also K. NORRIS & J. VAIZEY, *THE ECONOMICS OF RESEARCH AND TECHNOLOGY* ch. 7 (1973).

count active solar collectors. One can drive through a city and point out the solar water heaters which have been installed as a result of an ordinance. Though passive solar space conditioning can usually be shown to be more cost effective than solar water heating⁵ and could potentially save more energy,⁶ passive space conditioning is conceptually more difficult to understand and much less visible than solar water heating.⁷

Solar water heating ordinances (either domestic water heating or pool heating) offer a good starting point for developing a series of local energy-conserving regulations. The technology is simple and easy to understand. It is relatively inexpensive and is applicable to almost every structure. The solar access problems which accompany the passage of a solar water heating ordinance are simpler than those for a passive solar ordinance,⁸ and when proposed for new housing, where economies of scale can reduce costs, it appears to be one of the easier ordinances to pass. Because of its political attractiveness the community may receive publicity and attention which will encourage it to consider other actions to conserve energy. Passage of the initial ordinance can stimulate peo-

5. Passive solar space conditioning can save 70 to 85 percent of the heating and cooling costs of a house. CALIFORNIA ENERGY COMMISSION, FINAL ENVIRONMENTAL IMPACT REPORT FOR THE CALIFORNIA ENERGY COMMISSION SOLAR PROGRAM AND WIND PROGRAM 7 (1980) [hereinafter cited as IMPACT REPORT]; see generally CALIFORNIA ENERGY COMMISSION, PASSIVE SOLAR HANDBOOK (1980). It should be noted that several of the comments to the IMPACT REPORT objected to the upper limit on energy savings from passive space heating and cooling. These comments suggested that 100 percent savings are possible. CALIFORNIA ENERGY COMMISSION, ADDENDUM TO THE SOLAR PROGRAM AND WIND PROGRAM FINAL ENVIRONMENTAL IMPACT REPORT 3 (1980) (comments of Harold Hay and Senator James R. Mills).

6. SOLAR IMPLEMENTATION AND COORDINATION COMMITTEE, CALIFORNIA ENERGY COMMISSION, DECADE OF THE SUN: PROGRAM PLAN FOR THE MAXIMUM IMPLEMENTATION OF SOLAR ENERGY THROUGH 1990, at 87 (1980) [hereinafter cited as DECADE OF THE SUN].

7. Passive solar space heating in new residential construction is, to a large extent, just good design. Proper orientation of the structure on the lot is one element of passive solar space heating. Where wintertime heating is required, passive solar measures may include placing most of the windows on the south side of the building and providing adequate roof overhangs to prevent overheating in the summer. Most of these elements cost little or nothing and require little except thoughtful design. Even those which add cost, for example, adding extra "thermal mass" to the structure, reduce the size and cost of any backup furnace and may eliminate the need for air conditioning equipment altogether.

8. Protecting solar access for a sixty square foot south facing roof area is much easier than protecting solar access for the entire south facing vertical wall of the house. See AMERICAN PLANNING ASSOCIATION, PROTECTING SOLAR ACCESS 1 (1980) (published under the auspices of the California Energy Commission); CALIFORNIA ENERGY COMMISSION, SOLAR ACCESS: A GUIDEBOOK FOR LOCAL COMMUNITIES 37 (1980).

ple to perceive local efforts and local control as the solution to our energy problems, rather than leaving solutions up to the state and federal government. Communities can begin to see themselves as actually having an affect on our energy problems, as well as serving as a model for others.⁹

D. Why Solar Water Heating in New Housing?

A solar mandate ordinance affecting only new housing is easier to implement and enforce, and is less likely to pose a hardship, than an ordinance affecting all housing. There are three key groups affected by a regulation affecting new housing: new home builders, local building officials, and new home buyers. New home builders can recoup any added cost by raising the price of the house. Local building officials are probably dealing with some solar systems already. For them, requiring solar devices in all new housing might even present opportunities for standardizing the method for handling solar water heaters. For new homebuyers, the addition of solar water heating to a new home may increase the cost by \$1500 to \$3000. However, this increase would seldom make a significant difference in available financing, particularly with the average price of housing in California over \$100,000 in many communities.¹⁰ Though the increase could add \$16 to \$33 per month to the mortgage,¹¹ it will reduce the utility bills by as much or more than the increase in the monthly payment. In addition, the homeowner could receive up to 55 percent of the cost of the system back in the form of a tax credit. In Davis, California, one builder is offering the home buyer the option of using the tax credit (which would be obtained the following year) as part of the

9. The County of San Diego, which was the first to pass a water heating mandate, *see* note 1 *supra*, has now passed three other energy ordinances. Santa Clara and Santa Barbara Counties, also among the first to pass solar water heating mandates, have each passed two additional energy ordinances. There is now, in fact, a trend toward submitting a whole package of conservation/solar ordinances for consideration in order to design a comprehensive local energy program (though the effective dates for the various ordinances frequently differ).

10. *See, e.g.,* Kinchen, *Prices Up 4.1% for Appraised Houses*, Los Angeles Times, Nov. 23, 1980, § IX, at 2, col. 1, reporting the results of a survey of houses in Southern California counties. The survey covered existing housing and found the average price of the houses sampled was \$124,100. A similar survey of new home prices in Southern California is contained in REAL ESTATE RESEARCH COUNCIL OF SOUTHERN CALIFORNIA, REAL ESTATE AND CONSTRUCTION REPORT, SECOND QUARTER (1980). For single family tract houses in Los Angeles County, for example, 3000 of the 3605 new houses constructed or under construction were over \$100,000. *Id.* at 37.

11. A \$2500 system would add \$27.65 per month to the mortgage payments, calculated at an interest rate of 13.0 percent.

downpayment. This builder feels the marketing value of his offer is worth more than the loss of one year's interest on half of the cost of the system.

E. Why Mandate on the Local Level?

Mandating is politically easier to do locally than statewide. Communities can be self-selecting, based upon the availability of equipment, favorable climatic conditions, and a positive community attitude toward implementation. Since a mandate must always be ultimately implemented on the local level, it is much more likely to succeed if the regulation is initially designed to meet local needs and has local support.

One of the most important advantages of local regulation over state or federal regulation is that it can be tailored to meet the specific needs and conditions of the community. Because local regulations are usually easier to modify than are state or federal regulations, they can be more innovative, and yet retain the flexibility to respond to changes in technologies, materials, or techniques.

Local ordinances can also serve as a model and testing ground for subsequent statewide action. Not only does this provide an opportunity to discover, on a smaller scale, whether or not such regulations are feasible and provide the desired results, the Legislature is more likely to take action if it has a successful model upon which to pattern its policies. If there is assistance by, and coordination with, appropriate officials at the state level, local mandating activities can serve as models for the smooth development of a statewide standard. This will allow a gradual phase-in of mandates by communities in the State on a self-selected basis according to a locally chosen time line. The State then needs only to come into the picture near the end of the process to incorporate the recalcitrants and legitimize what has become "standard practice."

Finally, the "innovator communities" can receive the positive publicity of being first. Moreover, their citizens can receive the added benefit of tax credits and/or rebates, priority processing, and other incentive programs which are likely to be unavailable if a mandate is implemented statewide. These benefits, along with community grants and/or other supplemental funds, will help to offset the extra difficulties and expenses associated with being among the first to implement a new program.

II.

SUBSTANTIVE REASONS SUPPORTING MANDATING OF
SOLAR WATER HEATING¹²

A. It Saves Energy

The use of a solar water heater reduces the use of natural gas and electricity.¹³ This natural gas and electricity can then be directed to other users. Any natural gas saved in the residential sector is sold to lower priority customers—industrial and power plant facilities. The natural gas is sold to these customers at the marginal (highest) price, not the average price, so revenues from the gas are greater. In some cases the natural gas made available to industry and utilities replaces fuel oil, which will have additional environmental benefits.

Electrical savings reduce the need for new electrical generating capacity. Each ten kilowatt-hours of electricity saved at the point of use is equivalent to about thirty kilowatt-hours of energy supplies (*i.e.*, fuel oil, natural gas, etc.) which did not have to be used to generate that electricity (when efficiency losses are included).

Solar water heating systems also show a net energy gain when analyzed from the total energy perspective. In a report prepared for the United States Congress by the Office of Technology Assessment,¹⁴ it was calculated that 185 to 320 kilowatt-hours per square meter are required to manufacture a collecting system, while that same system would offset 930 kilowatt-hours per square meter per year, or a payback time of 2.4 to 4.1 months for the “embodied energy.”

12. Portions of this material were adopted from the excellent reports issued by the cities and/or counties of Los Angeles, San Diego, Santa Barbara, Santa Clara, and Sacramento, who have been the innovator communities for California.

13. The annual energy savings that accrue from the use of a solar water heating system can vary dramatically according to the type of system used and the geographic setting. A California study indicates that one type of solar water heating system was able to provide 96 percent of the energy required to heat water when located in the city of El Centro, but only 48 percent of the energy required to heat water when located in Eureka. At the same time, a different system, also located in El Centro, only supplied 19 percent of the necessary energy. J. BERQUAM, M. YOUNG, S. PERRY, & J. BAUGH, A COMPARATIVE STUDY OF SDHW SYSTEMS IN CALIFORNIA 5.12 (1979) (a report prepared for the California Energy Commission by California State University, Sacramento).

14. U.S. OFFICE OF TECHNOLOGY ASSESSMENT, APPLICATION OF SOLAR TECHNOLOGY TO TODAY'S ENERGY NEEDS 220 (1978) (Table VII-6).

B. It Saves the Consumers Money

Solar water heating systems save money for the consumer. For a local mandate to become law it must be shown cost effective for the consumer.¹⁵ Economic analyses done for the communities in which solar heating has been shown cost effective indicate lifetime savings to individual households of up to \$1200 (in current dollars) over the average cost of heating water with natural gas and \$2175 over the average cost of heating water with electricity.¹⁶ Even more dramatic savings can be shown for solar hot water systems in multi-family housing.¹⁷ An additional benefit can be found in the fact that the money saved remains in the community instead of being paid out for "imported" energy supplies.

C. It Creates Employment

Local mandating of solar water heating can create new employment opportunities, as well as other economic benefits which accompany a new industry in a community. A recent California Energy Commission investigation of the effect of a solar mandate on employment found that in producing the same amount of useable energy, solar energy can create five to ten times the number of jobs as coal or nuclear power and at least three times as many jobs as oil-based power plants.¹⁸

A local solar mandate can be tied to a job training program and the development of local industries to provide associated products. These direct impacts can be further targeted, if desired, toward specific neighborhoods or subpopulations.

D. Environmental Benefits

When solar energy offsets the use of conventional fuels, environmental benefits accrue. One of the most important benefits is the improvement of air quality due to the decreased use of combustible fuels such as natural gas and fuel oil. Even considering the emissions due to manufacturing solar system components, the *Environmental Impact Report for the California Energy Commission Solar Program and Wind Program and Decade of the Sun: Program Plan for Maximum Implementation of Solar Energy*

15. CAL. PUB. RES. CODE § 25402.1(f)(2) (West Supp. 1980).

16. These figures were determined by the Solfin II computer model for economic analysis of solar water heating systems. Solfin II was developed by the California Energy Commission.

17. *Id.*

18. DECADE OF THE SUN, *supra* note 6, at 128-29.

Through 1990¹⁹ calculated significant overall reductions in air pollutants, particularly nitrous oxide and sulfur oxides. In addition, solar technologies do not involve the health risks associated with coal and nuclear generated energy. In *Decade of the Sun*²⁰ it was estimated that 21.6 trillion BTU's of energy could be saved annually in California by 1990 through the mandating of solar water heating in new houses wherever it was cost effective in the State.

E. Improved Consumer Protection

A solar mandate cannot succeed without an effective consumer protection program. When only a small number of systems are being installed equipment standards and warranties may be slow to develop. A mandate stimulates the government and private industry to insure that high priority is given to the rapid development of an effective consumer protection program.

F. Improved Solar Industry

When a solar mandate is passed there is an immediate increase in the demand for solar equipment. A recently completed survey indicated that most companies manufacturing solar equipment are operating at 60 percent of capacity or less.²¹ Increased demand should raise their operating capacity to a more efficient level as well as open the market to more firms. This would increase competition (reducing the price) and, when accompanied by a strong consumer protection program, help to improve the quality of the products being marketed. In addition, the visibility of solar collectors will increase consumer awareness of solar energy's potential. This will tend to enlarge the market and speed the maturation of the industry. Finally, by requiring that all builders participate, a mandate can ensure that the use of solar water heating does not place some builders at a competitive disadvantage. This disadvantage would result from the fact that the solar water heating system, though cost effective over the life of the system (especially with the tax credits), will raise the initial purchase price of the house and make it appear more expensive. Human nature

19. IMPACT REPORT, *supra* note 5, at 45; DECADE OF THE SUN, *supra* note 6, at 127.

20. DECADE OF THE SUN, *supra* note 6, at 53.

21. Unpublished survey conducted by the Solar Office, California Energy Commission.

causes people to be more likely to discount savings in the future and place a greater emphasis on first-cost savings.

G. Benefits to Existing Housing

Since a solar mandate should improve consumer protection, increase solar's visibility, and accelerate the maturation of the solar industry, a mandate would also tend to increase and benefit the solar retrofit market. Existing housing is more difficult to affect than new housing but the successful use of solar water heating on all new housing would certainly be expected to provide a model for the solar retrofitting of existing housing.

H. More Energy Self-Reliance

By reducing the dependence upon natural gas or electricity the nation's (state's and community's) dependence on foreign sources of energy, along with the resultant inflationary impacts, is lessened. By replacing natural gas with solar energy in the high priority residential sector, more natural gas can be made available to lower priority users who might otherwise burn fuel oil. This reduces the vulnerability to fuel supply interruptions.

I. It Is in Society's Best Interest

The required use of solar hot water systems is in the best interest of society because to the extent that some individuals choose not to use solar energy, society as a whole must pay for their indulgence by continued reliance on conventional energy sources with accompanying subsidies and environmental costs.

III.

REQUIREMENTS FOR A SUCCESSFUL MANDATE

In order to be successful, solar mandating should be carefully structured and should include other programs designed to help smooth the way for effective implementation and enforcement. The following are the minimum requirements for a successful solar mandate:

(1) The regulations should be reasonable and easily understood by those who must comply with them and those who must enforce them. The ordinance should include provisions for exemptions in situations where there is no solar access or where it is not technically or economically feasible to comply. However, the exemp-

tions should be carefully framed to avoid loopholes for general noncompliance.

(2) Professional training programs and public information campaigns must accompany the mandate. Both the public and the professionals involved must know and understand what they must do to comply with the ordinance. They must also understand how to design, build, and install a solar water heating system to produce the desired end result. In addition, the people charged with enforcing the regulation should be both well trained to understand and enforce it, and reasonably convinced that it is worth enforcing. This implies the development of training programs for installers and building officials, special workshops for builder/developers, architects, and lenders, and information programs for the general public.

(3) There should be no conflicting codes, ordinances, or regulations which obstruct easy compliance. This includes guarantees of solar access. Incentive programs should be consistent. For instance, the practice (until recently) of giving utility line extension credits for all-electric homes was in direct opposition to the purposes of a solar water heating mandate.

(4) The regulation should be flexible enough to accommodate changing developments in technology, materials, and techniques.

(5) A good consumer protection program will be the key element in designing a successful mandating program. The public needs to be assured that solar water heaters will perform in the manner desired and that redress is available if they do not. In addition, there must be protection against the fraud and deception which can always accompany a new industry. The critical factor is not that solar water heaters be viewed as perfect, but that they be perceived as no more risky or problem laden than conventional water heaters.

State government can play a major role by providing a consumer protection program to support local mandates. This has the advantage of protecting the solar industry from having to meet different sets of performance standards in each community and will provide consistency among local community mandates so they can be easily incorporated into a statewide mandate when that becomes appropriate.

If an unsuccessful mandate is passed (*i.e.*, unsuccessful because of a lack of consumer protection against fraud and defective or improperly installed systems, or because of an insufficient number of trained building officials to implement the ordinance), the

backlash could be devastating to the marketing of solar energy technology. It is the risk associated with the accelerated marketing of any new technology. Although from an engineering standpoint solar water heating technology is ready for widespread use, only a company's long-term experience in system installation and its "track record" can help consumers distinguish one solar company from another. This element of long-term experience is lacking in much of the solar industry. The question thus becomes, how does this risk to the consumer compare with the risks associated with continued high levels of nonrenewable energy consumption? If government decides it is in society's best interest to move as rapidly as possible in the use of renewable energy sources such as solar and that mandating of solar technology on the local level is an important tool for achieving this, then government should also be willing to eliminate or share any increased risk to the consumer through the implementation of an effective consumer protection program.

As previously stated, most of these problems are preventable through thoughtful planning and design of a comprehensive solar consumer protection program as outlined above. Initially this responsibility is being shouldered by local governments but by the date of publication of this article a comprehensive state solar consumer protection program should be in place in California.²²

IV.

THE MAJOR PROBLEM OF MANDATING

Probably the greatest single problem encountered in mandating is the psychological one associated with the word "mandate." People generally do not like to be forced to do anything, even if it is something they intend to do anyway. Though much of our everyday life is regulated, most people do not recognize it or label it as such. We are mandated to have certain inoculations against disease, to carry automobile insurance if we drive cars, to drive on the right side of the street, to have indoor plumbing, to use specific building materials, and to have two doors to the outside of each house. Part of the problem is semantics. As one builder said, "I'm opposed to mandating . . . but I'm not opposed to requiring solar in the building standards." A California Energy Commission sur-

22. As this issue goes to print the California Energy Commission is still working on a program titled CalSol. CalSol will combine a standards and certification program with a comprehensive warranty program. For a sense of the specific goals of a consumer protection program *see* 84 CAL. PUB. UTIL. COMMISSION 550, 565 (1978).

vey of public attitudes regarding solar energy provided similar reactions.²³ Out of a random statewide sample of 812 persons: Eighty-eight percent thought it was important for government to set standards for solar equipment; 7.7 percent were opposed. Sixty-three percent thought it was important for government to require the use of solar equipment whenever possible; 28.6 percent were opposed. Sixty-seven percent thought it was important for government to require the use of solar equipment on all public buildings; 20.6 percent were opposed. Although these results would appear to indicate significant support for solar mandates, when asked whether they supported solar mandates, forty-five percent of the same sample *opposed* mandating.

Overcoming this semantic anomaly and the accompanying negative attitude toward mandating is one of the most difficult challenges facing communities interested in passing a local solar water heating regulation. Hopefully, public information programs which include a thorough discussion of the issues will provide a first step.

V.

CONCLUSION

It is unfortunate but time is running out for finding solutions to our energy problems and options are being foreclosed. If we do not change our energy consuming habits we may find ourselves "mandated" into very undesirable options by default rather than by plan. As the saying goes, "If voluntary compliance really worked, Moses would have come down from the mountain with guidelines."

23. CALIFORNIA ENERGY COMMISSION, THE POTENTIAL MARKET FOR SOLAR EQUIPMENT AMONG CALIFORNIA HOMEOWNERS 146 (1980).

