ENERGY AND COMMUNITY PLANNING: A TALE OF TWO CITIES

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INTRODUCTION

At first glance, the differences between Los Angeles and Davis, California are overwhelming. Los Angeles is a full-grown metropolis of over two million people, so comprehensive in its variety that it contains slums and enclaves of wealth, industrial parks and beaches. Over half of the people in Los Angeles are members of minority groups. The theme of variety extends to the climate as well. Los Angeles has climatic areas ranging from mountains to coastal Mediterranean zones.

Davis, by comparison, is homogeneous. Both its population of 38,000 people and its geography are remarkably similar throughout its 6.7 square miles. Located in California's central valley about 18 miles southwest of Sacramento, it is tied to agriculture by location and the presence of the University of California at Davis (UCD), the UC system's main agriculture school. The college-town atmosphere has created a heightened interest in local affairs, and this, among other factors, has increased citizen involvement in local politics.

The obvious differences between these two cities can hide some important similarities in the area of energy and its use. To begin with, both cities experience mild winters, although winters in Davis are somewhat more severe than those in the Los Angeles central basin climate--2,800 vs. 2,100 heating degree-days, respectively. The Davis cooling load is also similar to that of Los Angeles. Both cities grew substantially during the 1950s and 1960s, resulting in an older core (or cores in Los Angeles) of low-rise commercial buildings surrounded by fairly low-density residential areas.

This settlement pattern has created a remarkably similar residential building mix. Both cities have large tracts of single-family homes of varying age, and in both cities over 50 percent of housing is rental units. These rental units are newer in Davis, and the average unit appeals to the student market; the extremes of wealth and poverty of Los Angeles are not apparent in Davis. Because of high demand, housing prices have increased rapidly in both cities, and vacancies have decreased. A controlled-growth policy in Davis and rent control in Los Angeles have constrained the market in each area.

Another important similarity of the two cities is their location in the same state. As California cities they share the group of state commissions, a common state government, and a host of quasi-governmental boards and associations that operate state-wide. These groups affect not only local government actions but also the energy utilities operating in each city.

The utilities themselves provide interesting points of similarity and contrast. Davis is served by the Pacific Gas and Electric Company (PG&E) for both electricity and natural gas. This investor-owned utility is located in San Francisco. Los Angeles is served by the Southern California Gas Company (also an investor-owned utility) for natural gas needs and by the city's Department of Water and Power (DWP) for all electricity needs, making DWP the largest city-owned utility in the United States. PG&E and DWP generate about 60 percent of their electricity annually with oil. PG&E gets much of its natural gas from Canada, while Southern California Gas obtains its gas from Texas. The problems and the organization of these utilities are important, too, as they relate to the difficulties with which each city has faced the "energy crisis."

THE PLANNING PROCESS BEFORE THE CRISES

In the early 1970s both cities had created major new master plans, with heavy emphasis on growth management. Los Angeles hoped to control growth by developing highly urbanized centers, which would contain almost all commercial and most new residential development. This would allow new growth while preserving the low-density neighborhoods many residents find attractive.

Davis faced a slightly different problem. With enormous development pressure from Sacramento, only 17 miles away, it wished to preserve its sense of community cohesion. Overall size was even more of an issue than population density. After studies had indicated that, with unchecked growth, the population would reach 90,000 by 1990, a general plan was adopted which set a goal of 50,000 for 1990.

THE INITIAL ENERGY CRISIS, 1973-1975

It is fair to say that neither city was prepared for the initial shock of oil supply curtailment in 1973. After the initial shock, Los Angeles was able to mobilize its resources quickly. In the winter of 1973-74, DWP faced a serious shortage of oil to fuel its generators. Blackouts would have occurred almost immediately unless serious conservation steps had been taken.

A blue ribbon citizens' commission was appointed, and it recommended a simple solution. They demanded that everyone reduce energy consumption by 10 percent in the residential and industrial sectors and 20 percent in the commercial sector, compared with the same period in the previous year. A violation during the first stage would result in a 50-percent surcharge. A violation during the second phase, if one was called, could result in termination of service. Exemptions were possible but very difficult to obtain. The support of the blue ribbon committee and the media, and the "emergency" nature of the demand, helped the program succeed. Overall consumption was down 18 percent in the residential sector, 21 percent in the commercial sector, and 11 percent in the industrial sector. A second-phase alert was never declared.

Although this program has been heralded as a model conservation effort, two of its aspects could have long-term negative side-effects. For practical and political reasons, the ordinance was suspended when more oil became available in March 1974. This lifting of the restriction signaled to people that the "energy emergency" was over and there was no long-term continuing problem. In spite of this, consumption remained 14 percent lower in the next year and only reached pre-embargo levels again in 1979. Secondly, since the cutback was based on the previous year's consumption, no credit was given for earlier conservation efforts. This has caused a feeling, particularly in the commercial sector, that those already conserving energy would have to cut back 20 percent more during the next crisis while their wasteful competitors could cut 20 percent of the "fat" next time, and not affect business operations. In conversation with utility personnel, businessmen have indicated that this is a major factor in commercial resistance to conservation efforts.

In Davis, the 1973 energy crisis had little impact on city government directly, as the city council was occupied with the lengthy approval process for a new general plan. Instead, the crisis had its most important impact on a group of graduate students at the University of California, Davis. In the fall of 1973 these students began in-depth technical studies of energy consumption in several student apartment complexes around the city. The studies indicated that energy use in apartments in the same complex could vary by 24 percent on a summer day, depending on orientation. This resulted in a variation of kWh usage of over 300 percent. Winter analysis of other apartments indicated a 17°F temperature increase could result in a 30-percent increase in gas consumption.

Other research by the students indicated that these factors were relevant to all Davis residents--not just occupants of student apartments. Average residential electrical use was 50 percent higher in Davis than in the state as a whole. Positive correlations were found between energy consumption and number of children, washloads per week, and appliance ownership (particularly ownership of air conditioners, freezers, self-defrosting refrigerators, and clothes dryers). Changes

were possible. The top 15 percent of energy consumers used over four times as much energy, on the average, as the lowest 15 percent (and almost four times as much as the average household).

This wealth of data resulted in the city's joining the graduate students in seeking a grant from the U.S. Department of Housing and Urban Development for more research, eventually resulting in a building code for new residential structures, planning guidelines, an educational program, and prototypical plans for low-income passive-solar homes. In 1975, a grant of $86,000 was awarded to the city, naming Living Systems (a consulting firm organized by graduate students) as prime contractor.

What followed was almost a textbook case of the way a participatory democracy is supposed to work. Public groups ranging from the League of Women Voters to the schools became involved, as did commercial groups like the Chamber of Commerce and the Rotary Club. Developers, sensitive to the marketability of new housing because of its appearance, were recalcitrant and won exemptions for areas subdivided before 1974. After much discussion, the code became law on January 1, 1976 (causing a very large number of houses to be submitted for certification in late December, 1975).

Unfortunately, a workbook explaining how to meet the code took more time to prepare than was anticipated. The manual required repeated reviews by City Building Inspection officials, and was not available until July 1976. The workbook, publication of a quarterly newsletter in early 1976, and a series of seminars to educate building inspectors and developers helped to end a very difficult period in the first six months. Some city officials felt that having most of this information ready for release earlier would have avoided much of the initial confusion and animosity between building inspectors and developers.

THE GROWTH OF POLICY, 1976-1978

After the crisis in supply was over, new oil became generally available at 5 times the previous price to the Los Angeles DWP. By late 1974, the Los Angeles City Council was forced to consider substantial rate increases. After 11 months of deliberation, the council finally approved some increases, under the provision that no additional rate increase would be adopted without extensive studies of alternatives. In early 1976, Los Angeles Mayor Bradley again turned to a citizens committee. In contrast to the first committee, which had been faced with six days of intensive work, the new committee faced what turned out to be two years of study and compromise.

The rate-restructuring plan had four major components: Declining block rates for electricity, which decrease as use increases, were replaced with time-of-day charges for large commercial users and a constant kWh charge for all residential customers. The practice of charging some fixed costs to all customers as a base charge was eliminated, and everyone paid in proportion to their use (extending a kind of "lifeline" rate to many). Costs for residential and commercial service were separated. Finally, consumers could sell electricity back to the utility at a standard rate that encouraged onsite electrical generation. These four provisions were adopted and went into effect in December 1978 after much debate and several legal challenges. Charging on the basis of marginal cost (the cost of generation of new units of electricity used) makes this plan one of the most innovative in the country.

In an effort to capitalize on private research in the region, Mayor Bradley also formed the Solar City Committee in 1976. With its members from the solar community, the committee was to advise Mayor Bradley on technical and policy matters. The committee has had a mixed record--effective in some areas but with little impact in others. There are several reasons for this.

Active solar system development has thrived in Southern California, and many of the Solar City members were drawn from this field. In spite of the presence of others on the committee, these members have given the committee an active-solar technical orientation. While this has helped

settle technical issues, the committee has also been mandated to be an advisory panel. It has sometimes not recommended the most practical ways to implement a technical position as policy. For example, on October 15, 1976, the committee was asked to review work that had been done by the City Planning Department on solar access rights. They reached a consensus on these points:

- As a matter of public policy, property owners' rights to sunlight should be protected.

- A legal opinion regarding the possible need for state enabling legislation should first be secured before enacting any local zoning regulations to preserve solar rights.

- The matter of possible infringement on development rights of property owners adjacent to solar installations requires further study.

As recommendations these are not specific enough to be implemented as actual policy. The second item should have been clarified before the committee examined the report. Furthermore, if access is to be protected, there must be some infringement on development, on a citywide scale. Similarly, the third item gives no direction to the Planning Department. (Does the committee mean that the Department should minimize infringement or establish compensation?)

Calling a committee "advisory" is not enough to ensure that it will make an important technical contribution. This committee could have, but the Planning Department had little solar expertise on its staff at the time. Most of the technical parts of the Committee report were lifted directly from other documents, and some important access issues were omitted. For example, there was no discussion of level or duration of access; nor was there discussion of passive, offsite, or multibuilding solar collection. (Some of these points were mentioned in codes written by other cities and in the proposed ordinance by the Los Angeles City Attorney.) Technical support added by the Solar City Committee

could have given the ordinance greater credibility with the council and the public. The lesson here may be that while many advisory committees are tempted to be statesmanlike in their pronouncements, they may increase their credibility by evaluating specific technical concepts.

This particular solar access ordinance did not have a happy ending. The final ordinance proposal was forwarded to a council committee and permanently tabled. In spite of support from the Mayor's office and some members of the Council, no concerted effort was made to reintroduce it. One opinion is that it was premature and would have enraged developers and property owners who were facing rent control at the time. Jealousy on the part of some council members over the fact that the Mayor, not the council, had introduced the action probably played some part as well. The lesson is clear: solar energy cannot "rise above" or remain independent of local politics, and it should not be expected to.

While Davis was also going through a lengthy series of hearings for the new building code, it adopted several other strategies for saving energy in the community, and as a result, those in Davis city government have reached an important conclusion: overall community planning may have a greater potential for energy conservation than dealing with individual buildings, for two reasons. First, cities create their own microclimates which frequently have adverse impacts on local buildings; and second, Davis residents, like residents across the United States, use enormous amounts of energy in the form of gasoline for the private automobile. These two uses are immune to building code regulation and can be changed only if we change the ways we plan our communities.

Davis addressed the issue of microclimate through an aggressive program to reduce heat build-up and reduce water demand. Through a city ordinance, Davis required that all new commercial parking lots be protected by shade trees. These trees had to be planted so that 50 percent of the lot would be covered at the end of a 15-year growing period. Many acknowledge that a shaded lot is pleasant, but ask if it really saves energy. Unshaded blacktop can raise the air temperature $10^{o}F$ above the ambient temperature. This in turn places a tremendous load on surrounding buildings during the hottest part of the day, increasing

energy consumption by as much as 50 percent, depending on the building's design.

For similar reasons, street widths were reduced. A side benefit of this was a reduction of up to $1,000 per lot in development costs in 1976.

Proper landscaping can help in other important ways. By using only deciduous trees for city planting and encouraging their use in the private sector, Davis has created a cool, shady environment during the summer and a sunny and warm one in the winter. Similarly, by using and encouraging drought-tolerant plants, water and the energy needed to pump it can be conserved. Davis obtains all of its water from city wells, and pumping it costs the city $124,000 annually--more than any other electricity use except street lighting.

To reduce transportation costs, Davis has taken three policy steps. First, the city began to underwrite and expand the University bus system. Seven used London "double-decker" buses were purchased and now operate on six lines throughout the city. They are as efficient as modern buses, but at the time the main reason for their purchase was their appeal as mobile advertisements for the system. They have worked well; ridership last year was 365,000 for a 175-operating-day season.

The second step actually had begun several years earlier. Even before the energy crisis, Davis residents loved bicycles. Through provisions such as an extensive (40-mile) network of bicycle lanes, separate bikeways, mandatory areas for parking around apartment houses and commercial areas, bicycle overpasses over dangerous roads, and even a bicycle policeman, their use has mushroomed. There are now more bicycles (40,000) than automobiles, and 25 percent of all trips taken within the city are by bicycle, saving about $1,000,000 worth of gasoline every year.

Instead of being supply-oriented, the third step was designed to reduce the need for transportation. Four strategies were undertaken with the goal of keeping people close to their destinations. First, instead of large enclosed malls, a series of neighborhood shopping

centers of no more than 50,000 square feet was zoned for. Second, to encourage pedestrian use, the downtown area was kept small, and tree-shaded courtyards were encouraged. Third, to further encourage walking, downtown mixed-use commercial and residential development was encouraged, in the hope that this would have a particularly beneficial effect for senior citizens who might want to live near downtown. Finally, at the other end of the spectrum, limited home occupations were encouraged. By a zoning amendment, people were allowed to employ one nonfamily member in a limited manner (no retailing, no uses that would create nuisances).

These efforts to reduce transportation energy use are linked closely to other efforts designed to encourage greater energy efficiency. Minimum lot size was reduced, fence and yard setbacks were made more flexible to optimize solar access, and restrictions on clotheslines were eliminated. (In fact, a private area for clotheslines was required for each new apartment house.)

Overall, these policies do result in energy savings; but how much? Despite the difficulties of measuring these savings, a recent report by the local regional planning commission compared overall residential energy consumption in Davis to that in two nearby communities, Vacaville and Woodland. The following per-capita changes in consumption occurred between 1975 and 1978:

	Change in Consumption	
City	Electricity (percent)	Natural Gas (percent)
Davis	-8.1	-22
Woodland	-4.7	-16
Vacaville	+.9	-15

In addition, per-capita peak consumption was reduced:

City	Change in Consumption Electricity (percent)	Natural Gas (percent)
Davis	-7	-20
Woodland	-3.5	-16.5
Vacaville	+5.5	-14.5

More recent information gathered on electrical consumption in Davis alone has shown that between the summers of 1979 and 1980, both peak and average electrical load were reduced.

In addressing the issue of whether codes have had a significant effect on energy consumption, the same report found that when certain statewide standards were adopted in 1975, residential electricity consumption in Davis declined 13-16 percent, and gas consumption fell 8-15 percent. Due to sound design, the developer did not have to change his house designs for the 1976 Davis code, and there was little additional change in consumption.

This is a reminder that building codes can't do it all. Even the most progressive code represents a minimum level of performance rather than an ideal situation. A study by Jan Hamrin at the University of California, Davis, compared energy use in two Davis subdivisions. The control group was a subdivision in west Davis built after the code was in place. The experimental group was a subdivision called Village Homes, an innovative community featuring solar-design houses and energy-conserving site planning. The results were that the average house in Village Homes used 71 percent as much natural gas as the average control-group house, and only 38 percent as much electricity (on a mean monthly basis). The Village Homes house used a total of only 54 percent as much energy as the average control-group house. On a seasonal basis, the Village Homes houses used 66 percent as many Btu's as the control-group houses in winter, 62 percent as much in spring, 42 percent as much in summer, and 64 percent as much in fall. These differences in energy consumption were attributed to the use of solar water heaters and passive solar design, neither of which are required by

code.

Attaching energy savings to the Davis lifestyle is even more difficult. Many savings are real and measurable--many more are as real but difficult to quantify. Ridership on mass transit is recorded, and bicycle traffic is measurable. Unfortunately, the assumption that everyone would have used an automobile for the same trip is unlikely, particularly in a community of students who may not have cars. The effects of microclimate modification are also difficult to measure, but the city government is attempting to quantify some of these.

In addition to measurable and unmeasurable energy savings, there are two other issues to be addressed through these planning guidelines. Ironically, they are both more germane to traditional planning methods. Before planners became interested in energy per se, they addressed many "quality of life" issues. There is no doubt, after Davis experience of the last four years, that sound energy conservation means a greatly enhanced quality of life, despite the public image of conservation as a sacrifice or hardship. If Davis had no tree-shaded parking lots, shopping would be much less pleasant. If only half the bicycle riders were to use automobiles, the major streets would be clogged and the parking problem would be immense. Fence and property setbacks can make the difference between a yard that is usable 8 months out of the year and one that is usable only four months out of the year. These benefits, like the desirability of a downtown shopping area, are hard to assess but should be included in "payback" analysis.

The other reason for undertaking these planning efforts is to be prepared for the future. While only a few people take advantage of the home occupation ordinance, it does give people that option. The same future payoff applies to the house setback flexibility and street width provisions. Two other important psychological effects also occur. Allowing residents choices in energy saving (having clotheslines for optional use or flexible setback regulations) places the burden of decisionmaking on the individual, forcing people to consider the problem without assuming that the government has made the final choices for them.

Another, sometimes contradictory effect, is a demonstration that the government does not think the energy problem is just a crisis, subject to a quick fix. By changing the small things, there is evidence that City Hall has given some thought to the problem of energy conservation and is joining its citizens for the "long haul." This can result in ordinances that reduce the freedom to choose. Building code ordinances and requirements of proper orientation of buildings, shaded parking lots, and even solar installations can be accepted, but only if citizens are convinced that government is requiring the most cost-effective measures.

AN EVALUATION OF THE CURRENT STATUS

In Los Angeles, after the solar access recommendations, (which were part of a larger solar bill) were introduced and tabled, many more successful projects were completed. The Mayor's office was responsible for several solar projects (including a city fire station), a study of cogeneration for the civic center complex, and obtaining a large master planning grant from the U.S. Department of Energy. This $650,000 grant is for an energy master plan for the city. When complete, the study will produce an energy component for the general city plan and a program of ordinances to be enacted.

The city has also taken two steps to further solar energy. At the direction of the city council, the Mayor's office examined the feasibility of mandating solar water heaters for all new residential construction. Staff research indicated that solar domestic hot water should be required both on policy and on economic grounds, and the Solar City Committee and a special task force concurred.

As a separate action, the city began to look at solar access again. In the fall of 1979, the city examined a zoning approach to solar access. This method, called the solar envelope approach, was originally developed by Professors Ralph Knowles and Richard Berry at the University of Southern California. Using this method, a three-dimensional imaginary solid is legally defined for every land parcel. As long as

the actual building constructed remains inside this solid, only "allowed" shadows are projected offsite. What constitutes an allowed shadow is determined by the time of day, level of access, surrounding building types, and other matters of public policy.

Three of the most interesting results of the study are the following: (1) There are no legal roadblocks to using a zoning approach for solar access; (2) Density depends entirely on the level of access protected, not on the method of protection; (3) For a fairly high level of access (protecting the entire south wall of a building), it was possible to obtain 40 to 50 dwelling units per acre and a 3- (or 4-) to-1 floor area ratio (a one story building covering the entire site has a floor area ratio of 1 to 1). These figures are dense, even in urban terms; only the city core would be denser.

A fourth result was that far more institutional resistance was discovered than resistance of any other kind. Any regulation of solar access demands some physical planning change. In subdivisions this may be small (moving a fence, prohibiting a tree), but in an urban area with powerful market forces at work, the changes can be significant. There was a great deal of resistance among many city planners.

Over the past 40 or 50 years, planners have hammered out a series of procedural and policy decisions that have served one central purpose: translating an amorphous set of "quality of life" and "future" goals into more concrete physical goals. For example, many on the staff had a difficult time accepting the USC vision of a solid wall of buildings with their facades set back to give light access to the street. While this design was planned around solar access, many could only see it as "Manhattanization"--their antithesis to a light-filled and open city. The "towers in the plaza" approach was almost universally prefered, ignoring the fact that the actual result of this in Los Angeles and most other cities has been closer to "Manhattanization." Energy-conscious design is likely to be judged by many as a prototypical image. It may be accepted or rejected, without consideration of its place in the existing architectural context.

Davis faces a period of consolidation, house cleaning, educational outreach, and other projects. In early 1980, PG&E gave the city a grant to hire a full-time energy coordinator. This would allow PG&E to become more involved in energy conservation at the local level. The person was to be hired by the city and work on projects based on the city's priorities.

Davis receives two or three phone calls a day and a similar number of written requests for information on its program. Everyone agreed that public information should have a high priority. In addition, several actions and programs were outlined by Living Systems in their original report which have never been implemented. Among these were solar access protection, a solar swimming pool, and an intensive community-outreach program. Several other policies had been implemented administratively; some of these are yet to be brought before the council for endorsement.

Finally, Davis wishes to undertake several special projects. Realizing that it has reached an administrative plateau in some projects, the next increment of energy savings may best be achieved through an individualized educational effort. Alternative financing strategies for energy improvements are also being explored with several private sources of capital. Several large projects involving solid waste recycling and the city's sewage treatment plant are also being examined.

CONCLUSION

In this thumbnail sketch of the energy policy development of these two cities, many programs have been omitted. In spite of this, there are some differences in approach between the two cities and it is my central thesis that these have resulted in respective successes and failure.

Los Angeles has had two advantages and two disadvantages, which have controlled energy policy. The first advantage has been ownership of its own electric utility. The city council, by having direct control over DWP (the California PUC has no authority over municipal utilities), has

been able to change basic policy. Rate increases and rate restructuring have encouraged energy conservation and investment in alternative sources. Los Angeles' second advantage has been its sheer size and power--both political and financial. It had been able to obtain state and federal money, tap in-house expertise, ask for assistance from local experts, and use money from its own budget to pay for some energy improvements.

Size has also been one of Los Angeles' principal disadvantages. Informing the public and reaching consensus are difficult in a city of 2 million people. This has been made worse by the politicians, elected by district, who generally have not viewed energy as a critical issue. Most politicians in Los Angeles have not been willing to define a strong energy policy. These two disadvantages--lack of political programs and large size--have resulted in a policy that allows market forces to be the sole determinants of energy policy. In the near future, several mandatory policies, such as solar access, solar hot water on new residential structures, and new, more restrictive building codes, may come before the council. The results of these measures may be a better indication of the city council's intentions regarding energy policy.

In contrast to the Los Angeles experience, Davis' small, manageable size and consensus among the local population, reflected by the council, have led to a cohesive, influential policy. The amount of technical expertise has also been substantial, particularly for a town of 38,000. The most important advantage Davis has had, though, is that energy policies began to have a synergistic effect some time ago, and each new policy speech or project has had an impact on local consciousnes.

The small size of the Davis government allows this synergistic effect to occur frequently. For example, the planning division and the building inspection division are both in the Community Development Department. At the time the various codes were being enforced, this arrangement allowed easy communication between the two departments most involved with enforcement. A similar case occurred when the city's retrofit ordinance went into effect. The city had been doing building inspections for several years, to check for other code violations. It

was much easier, from an administrative point of view, and less expensive from a fiscal point of view, to add the additional energy items onto an existing inspection system. If a new inspection had been required, the cost of the inspection and overhead would have fallen entirely on the energy program.

The issue of size is also the greatest challenge which faces the Davis City Council. With the city's small size and modest political power, it must leave most of the decisions that affect energy use up to others. It is powerless to provide significant help to the 25 percent of the Davis workforce that commutes to Sacramento. It has little influence on the University of California, an entity that affects the lifestyles of all Davis residents. In a county dominated by agricultural economics and in a regional government dominated by Sacramento, Davis will have a difficult time guiding its own energy future, let alone acting as an energy policy leader.