

## NOPEC-II

### Non-Oil Power Exporting Communities, Report II

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#### ABSTRACT

The present paper constitutes the second progress report on an effort to ensure the development of one or more multi-building communities in which energy consumption is reduced to a minimum and in which pollution is also minimized.

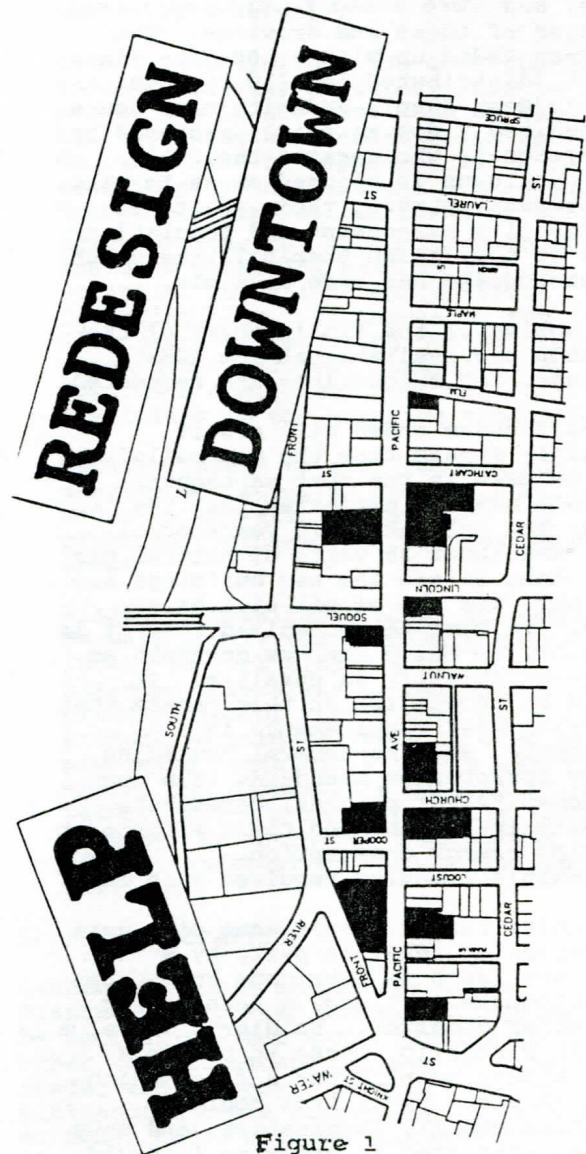
#### 1. THE RECONSTRUCTION OF SANTA CRUZ AFTER THE "LOMA PRIETA" EARTHQUAKE.

The "Loma Prieta" earthquake of October 17, 1989, started at 5:04 pm some 10 miles east and 10 miles south of Santa Cruz, registered 7.1 on the Richter scale, lasted about 20 seconds, and changed the face of the city:

1. Some 6,000 fireplace and stove chimneys were destroyed, most of which had been built with no reinforcement steel, and little if any Portland cement in the mortar.
2. In downtown Santa Cruz about 7,000,000 ft<sup>3</sup> of commercial building were destroyed, and 4 people were killed by falling bricks or structures (8). A map of downtown Santa Cruz shown as figure 1 shows the destroyed parts. The city looks like a war zone.
3. Most modern structures fared well. It is clear the modern earthquake codes are fairly adequate.

The earthquake also changed the careers of the authors and added a section to this paper. Two of the authors are actively involved in the earthquake reconstruction:

1. F. de Winter as member and past Chair of the Energy Advisory Committee of the city of Santa Cruz.



2. R B Swenson as member of the Traffic Commission of the city of Santa Cruz, and as one of the founders of "Santa Cruz Tomorrow," an ad-hoc citizen group involved in the reconstruction of the downtown.



Santa Cruz Tomorrow organized an extensive three day workshop, in conjunction with the Architects' Association of Santa Cruz County, the California Council, American Institute of Architects and local citizens, to explore design alternatives made possible by the fact that the earthquake had left us with a partial "tabula rasa." Almost 60 architects participated, including Paul Neel, California State Architect. About 100 citizens participated, many of whom spent perhaps 30 hours or more contributing local insights and ideas to the workshop architects. The participants were divided into six teams, and were asked to produce formal packages of ideas and drawings. The workshop ended up with a 100 page final report (distributed locally through Kinko's Copy Shop), and with many hours of unedited video material, produced by professionals who donated their time. A major followup is planned so as to make the property owners, their architects, and the city management and population aware of the design possibilities which the earthquake has made possible.

Some copies of the final report of the workshop are available at the ASSES meetings, and suggestions are requested.

The earthquake codes will almost certainly ensure that the new buildings will be safe in the next earthquake. The USGS however estimates that the U.S.A. has only about 16 years of oil left, and about 35 years of natural gas (5). Long before the new buildings are worn out, the age of oil will have ended. It must be recognized that it is mandatory to build the new downtown as energy-efficiently as possible. It should be recognized in this regard that the "Title-24" requirements in California, and the federal "Building Energy Performance Standards (the now abandoned "BEPS" program) constitute woefully inadequate and timid efforts at reducing energy consumption. Responsible planning requires much more.

On a quite regular basis some city gets destroyed, at least in part, by a hurricane (such as Hurricane Hugo), by an earthquake, a flood, a tornado, or some other disaster. Soldier's Grove, a city in Wisconsin, chose to become a solar energy model after a flood which wiped it out. Santa Cruz could do something equally imaginative, and many became interested in ensuring it would. A preliminary sketch of an organized program to do this was prepared by de Winter (3). Independently, Secretary Watkins of the US DOE wrote a gracious letter to Governor Deukmejian of

California offering assistance of this type (6), and many others got involved (6, 7). It is likely that there will be a major effort involving the California Energy Commission (CEC), the US DOE and many of its laboratories (SERI, LBL, ORNL, Sandia, etc), the city of San Jose (which has a solid staff in the energy field, and a formal program for city-wide energy efficiency), the Electric Power Research Institute (EPRI), the Pacific Gas & Electric company (PG&E), and other groups. The objective will not be simply to work on the problems of Santa Cruz, but also on those of Hollister, Watsonville, and San Francisco, and to develop a formal energy-efficient emergency-reconstruction program which can be applied immediately the next time it is needed, without the need to rediscover and reinvent the wheel every time a disaster strikes.

We will ensure that progress reports on this effort will be made at future ASSES conferences, and hope to get inputs from all those interested in the program.

## 2. NOPEC COMMUNITIES

In addition to its involvement in the earthquake recovery process, the NOPEC group is currently acquiring several projects in the Northern California area and Hawaii. Three of these are tied up in bankruptcy court. Being "White Knights" in bankruptcy court is a picturesque and curious human experience. Much of our work to create opportunities for sustainable solar energy systems involves attorneys rather than designers.

In all of the projects, environmental concerns are critical. These coastal communities are very sensitive to threats of exploitation, and only projects with solid environmental solutions can prevail politically. Attention here is focused on just one of these projects.

ALBORADA IS AN APPROVED SUBDIVISION for low and moderate income housing located on Green Valley Road near Watsonville in Santa Cruz County, California. The 26 acre property is zoned for 120 units of affordable housing.

We have formed a corporation, Alborada, Inc., to obtain all necessary approvals from the County, obtain construction financing, construct the site improvements and supervise construction of the housing units. The houses will be built by the owners, employing the mutual self-help method.



The Alborada team has built conventional and self-help housing, as well as commercial projects, with unskilled and/or socially disadvantaged laborers and at-risk youth. The team has skills in project management, job training, and energy conservation engineering. It has the financial strength and the requisite licenses to perform the work.

The project has been partitioned into three phases. There is a "riparian woodland" (a winter creek) on the site which in the original design was to have been bulldozed out of existence. It has been necessary to redesign the layout of some streets and lots to avoid the riparian woodland, to improve energy conservation potential (solar access), to allow for more gardens on the site, and to meet other environmental objectives.

## 1. HOME DESIGN

The home designs will be based upon simplified construction methods that do not rely upon a skilled labor force and are designed to achieve prompt results. The systems include energy conserving panelized wall and roof construction, modular kitchen/bathroom units fabricated on-site, low-cost passive solar systems, and devices for recycling of water and solid waste. In addition, we plan a construction phase waste materials recycling program.

## 2. ENVIRONMENTAL GOALS

The Santa Cruz County Board of Supervisors recently voted to place a proposed ordinance on the June ballot. Our plan addresses the County's stated environmental goals as follows:

**Global Warming:** We will employ cost-effective energy conservation and passive solar measures to reduce the use of fossil fuels required for home heating, lighting and so forth.

**Protecting Forests and Preserving Greenbelts:** We were flabbergasted when we first saw the tentative map approved for this project completely ignoring the riparian woodland. With our engineer we recently surveyed the site to determine the riparian boundaries and have redesigned an acceptable street layout which preserves most of the lots and leaves an attractive park in the middle of the site.

**Preventing Off-shore Drilling:** This requires two steps. One is to eliminate the need for oil, the other is to influence the external political climate.

Towards the first goal, as we have indicated above, our plan calls for significant energy conservation measures in the home. Furthermore, we have developed incentives to encourage reduced use of cars.

Towards the second goal, we are creating what can be a high-visibility project to document our community's commitment to a future beyond oil in the broader political arena and to demonstrate that solar energy and conservation measures are not only available to the upper and middle class, but for low income families with rigid budget constraints as well.

**Encourage Recycling:** The construction industry is very wasteful. This is partly due to the high cost of labor and segmentation of work teams to exclude a mix of capabilities. With self-help, youngsters and elders who cannot perform skilled tasks or lift heavy objects can be employed in such tasks as gathering bent nails or scraps of romex into appropriate recycling bins. Furthermore, the discipline of recycling during the construction process leads the way towards a continuation of that discipline in the maturing community.

We also intend to seek funding for a gray-water recycling program for water conservation. (Low-flow plumbing fixtures will be used in any event.)

**Aiding a Sustainable Local Economy:** We will modify the grading plan and intend to work within available planning parameters to maximize preservation of arable soil for productive gardens. We will also be providing training in skills which enrich our community's pool of talent, for a more sustainable local economy. We intend to incorporate edible landscaping. More detail is as follows:

## EDIBLE LANDSCAPING

Gardens and open spaces are often planted with bushes and trees that may be decorative, but which provide no other benefit except perhaps perfume, shade, and privacy. Examples include pittosporum trees or bushes, ligustrum or other hedge plants, bougainvillea or oleander bushes, etc. Some of these (e.g. oleander) may even be poisonous.

In a low-income or affordable housing development, it makes sense to use as much in "edible landscaping" as possible. Trees and bushes and hedges used can include laurel or bay leaf or other herbs. Fruit trees and bushes can



include figs, plums, apricots, lemons, limes, nuts of various kinds, cherries, pears, guava, etc. One can incorporate grape or kiwifruit vines. A variety of such plants can help reduce food bills, and serve as landscaping, while imposing little in care or cost, and needing little in spraying. Some plants might be inappropriate or undesirable. Apple trees might need too much spraying.

Oranges and grapefruit need a hot climate for sufficient sweetness.

We plan to go as far as possible in this area of edible landscaping, working with the self-help homeowners to determine and obtain the most appropriate and most inexpensive plants.

#### SOLAR PRIORITIES

When first called upon to assist the property owner, we did not intend to become the developers on this site. If other developers had been on hand to address even a few of the County's environmental goals, we would not have been anxious to pursue the project in light of the difficulties we encountered. However, no one emerged to be responsive to our passive solar designs and the CC&R for solar access proposed by Gail Boyer Hayes (4). The proposed deed restriction is as follows:

#### DEED RESTRICTION

"SUBJECT, HOWEVER, to each and all of the following covenants, conditions, restrictions and reservations, which shall run with the land hereby conveyed, and which shall apply to and be binding upon the grantee, its heirs, devisees, executors, administrators and assigns, namely:

#### SOLAR ACCESS RIGHTS

"That all houses shall have a minimum of 5% of the floor area of the living space in south-facing glass windows for passive solar heating, i.e., 50 sq ft of south-facing windows for a 1,000 sq ft house.

"That each house shall be constructed with 4 square feet of interior exposed high mass material (as defined by Title 24, California state energy standards) for each 1 square foot of south-facing window.

"That all south-facing glass and solar collectors in each house shall remain unshaded on December 21 between the hours of 9:00 a.m. and 3:00 p.m. (solar time). All houses shall have roof overhangs or other shading devices to fully shade all south-facing windows at noon (solar time) on June 21.

"That a minimum of 20% of all roof-top areas of each house shall be reserved for solar hot water collectors or photovoltaic solar collectors, and the designated area on each house shall remain unshaded each day of the year between the hours of 9:00 a.m. and 3:00 p.m. (solar time), provided that this restriction does not apply to utility wires and similar objects which obstruct little light and which are needed and situated for reasonable use of the property in a manner consistent with other covenants on this deed.

"That shading caused by the branches of deciduous trees shall be exempt from these restrictions.

"That homeowners may encroach upon their own solar rights.

"That by adopting this covenant, the landowners within this development recognize the desirability of creating and maintaining a common plan to ensure access to direct sunlight on all parcels within the development for public health, aesthetic, and other purposes, specifically including access to sunlight for solar energy collectors and passive solar south-facing windows."

#### THE SELF-HELP PROCESS FOR LOW-INCOME AND AFFORDABLE HOUSING

Low-income and affordable housing is often provided to people who had no involvement in its development or in its planning. Frequently this has led to a "neighborhood" which is not a neighborhood, but an instant slum. The people settled in the development do not care for each other, the design of the houses or the neighborhood layout does not fulfill their needs, and nothing in the process of getting them into the houses has empowered them in any way - gotten them involved in determining or affecting their own destiny.

Housing provided at costs below those provided in the free market need some sort of subsidy. This can come from a government organization or from a charitable organization. It can also involve donated labor, using the self-help process. Typically the self-help process involves teams of about 10 prospective homeowners, operating with the assistance and guidance of a skilled builder (in management, scheduling, technology, etc). The process helps ensure that all the homes get built in a timely and professional manner, and produces a neighborhood with a built-in community spirit. It has worked as an informal process in a number of developing countries, but can be used anywhere that low-cost housing is in short supply.



Standard construction techniques may not be the best suited ones in the self-help process. We feel that "stress-skin" panels, involving a foam core with two plywood or oriented-strand-board skins, may be especially suited to the self-help process. It leads to a house much easier to build than those involving "stick-built" technology, and lends itself to high energy-efficiency.

### 3. CONCLUSIONS

If such changes involved increased capital costs, one might argue for short term gain at the expense of the future, as has been the pattern in our business culture. In light of the emerging awareness of environmental constraints, the negligible capital costs to implement these measures, and the urgency of demonstrative local action, the new era of real estate development is ready to emerge.

### 4. REFERENCES

- (1.) R B Swenson and F de Winter: "NOPEC - Non-Oil Power Exporting Communities," Proc of the 14th National Passive Solar Conference of ASSES, Denver, CO, June 1989, pp 254-259
- (2.) Anon: "Downtown Santa Cruz Urban Design Workshop," Proc of a Workshop of February 23, 24, and 25, 1989, copyrighted by CEDAT and Santa Cruz Tomorrow, published by Kinko's Santa Cruz.
- (3.) F. de Winter: "A Program for the Energy-Efficient Reconstruction of the Buildings in Santa Cruz, Hollister, Watsonville, and San Francisco which were Destroyed by the October 17, 1989 Earthquake," December 7, 1989 Discussion Paper distributed from Santa Cruz, CA.
- (4.) Gail Boyer Hayes: Solar Access Law, Environmental Law Institute, Ballinger Publishing Co, Cambridge, MA, 1979.
- (5.) R.A. Kerr: "Oil and Gas Estimates Plummet," Science, Vol. 245, 22 September, 1989, pp 1330-1331.
- (6.) Correspondence
  - a. Letter of US DOE Secretary Watkins to Governor Deukmejian of California, December 14, 1989
  - b. Letter of Santa Cruz Mayor Wormhout to Mr. J. Michael Davis of the US DOE, December 14, 1989.
  - c. Letter of Watsonville City Manager Radin to Mr. J. Michael Davis of the US DOE, December 14, 1989.
  - d. Letters of US Congressman Leon Panetta to F de Winter, December 7, 1989 and January 19, 1990
  - e. Letter of J Michael Davis of the US DOE to Mayor Wormhout of Santa Cruz, January 22, 1990.
  - f. Letter of Supervisor Gary A. Patton of Santa Cruz County to F de Winter, Feb 7, 1990.

- g. Letter of Ann-Marie Mitroff, SC Energy Conservation Coordinator to Laura D Brown, Assistant City Manager of Santa Cruz, Jan 18, 1989.
- h. Letter of F de Winter to Arthur Rosenfeld of LBL, January 25, 1990.
- (7.) Visits re: Loma Prieta to Santa Cruz, October 17, 1989
  - a. F de Winter to F Stewart of DOE, December 11, 1989
  - b. F de Winter to F Stewart of DOE, December 21, 1989
  - c. F de Winter to F Stewart of DOE, January 4, 1989
  - d. M. Sloss of the CEC to Santa Cruz, February 22, 1990.
  - M. Sloss and F. Stewart of DOE to Santa Cruz, March 2, 1990.
- (8.) In the Code of Hammurabi (see Encyclopaedia Britannica, 1968, Vol 11, Page 43, Col a), if a building collapsed due to faulty construction and killed the son of the owner, the son of the contractor would be put to death.