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INTERIM FINDINGS OF PROGRAMMATIC OPTIONS
FOR A BUILDING DESIGN COMPETITION
FOR ENERGY CONSERVATION

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EXECUTIVE SUMMARYIntroduction

This is a summary of Phase I of what we now regard as a three-phase effort to establish and implement a building design competition for energy conservation. The three phases of this effort are: Phase 1, determination of feasibility, conceptualization of options, and study of institutional elements, Phase 2, analytical work to determine detailed design evaluation criteria and Phase 3, implementation and competition development. Phases 2 and 3 overlap. In the meeting between DHR and the Buildings and Community Systems (BCS) Division held in December, we agreed upon the following general requirements for the conservation building design competition:

- the design competition would focus on the multi-family low-rise residential market;
- it would result in the construction of units under a federally-assisted housing program;
- competitors would be professional architects, designers and/or developers;
- it would be structured to generate a high degree of public and professional awareness of conservation options in building design; and
- it would incorporate a common standard of energy efficiency measurement (e.g., Btu's per square foot).

In addition to these requirements, DHR added several other requirements that we determined, in our research, to be important to achieving the goals of the design competition. The design competition would be planned to:

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- minimize the time required to build the units;
- be incorporated into an existing building construction program with a minimum of programmatic modification or displacement; and
- leverage DOE funds.

Study Approach

In order to identify potential program options for the competition that satisfy the above requirements, we did the following:

- reviewed the literature of design competitions and awards programs and interviewed the sponsors of these programs.
- interviewed HUD personnel involved in public housing.
- talked to the American Institute of Architects (AIA), National Association of Home Builders (NAHB), National Association of Housing and Redevelopment Officials (NAHRO) and many others.

Findings

After screening many program options we selected two public housing construction programs to serve as vehicles for an energy conservation building design competition. The reasons for selecting them include:

- no major program changes would be necessary to incorporate energy conservation design into the existing public housing construction programs;
- the time until units could be constructed is relatively short;
- the competition would greatly leverage DOE funds;
- the designs would be applicable to similar housing in the private sector;
- technology transfer often occurs between the public and private building sectors;
- the buildings could serve as conservation demonstrations with follow-up monitoring;

- conservation design criteria could be incorporated at the earliest stages of planning; and
- HUD is concerned with high utility costs in public housing because they pay operating subsidies to meet these costs.

The two public housing construction programs that were selected as favorable vehicles for the competition are turnkey and conventional bid. Figure 1 shows the major steps in the two programs and the changes necessary to incorporate a design competition.

FIGURE 1

TURNKEY METHOD OF DEVELOPMENT
AND DESIGN COMPETITION CHANGES

<u>Usual Sequence</u>	<u>Design Competition</u>
1. The PHA applies to HUD for a program reservation for a desired number of units with specific functional objectives and design criteria.	Energy conservation is incorporated as an important design criterion in conjunction with DOE and HUD.
2. HUD grants the program reservation. The project is publicly announced and a "Developer's Packet," which includes design criteria and application forms, is distributed to interested developers.	Energy conserving design criteria are included in the Developer's Packet. A project site is pre-selected by the PHA.
3. Developers submit building design proposals and cost estimates.	
4. Competing proposals are judged by the PHA in conjunction with the HUD field office. One developer is selected as the contractor.	The evaluation criteria stress energy conserving design. Judging is performed by conservation experts selected by DOE and HUD in conjunction with PHA officials.
5. Construction is undertaken.	
6. Upon approval of the completed building the PHA buys the housing units from the contractor. The contractor turns over the keys to the PHA.	DOE begins monitoring building energy use.

CONVENTIONAL BID METHOD OF DEVELOPMENT
AND DESIGN COMPETITION CHANGES

<u>Usual Sequence</u>	<u>Design Competition</u>
1. The PHA applies to HUD for program reservation for a desired number of units with specific functional objectives design criteria.	Energy conservation is incorporated as important design features.
2. HUD grants the program reservation. The PHA selects an architect to design the project and estimate total development costs.	The selection of the architect and building design is based on a competition stressing conservation design.
3. The PHA publicly announces the housing project; interested contractors are sent an information package which includes the winning design.	
4. Developers submit bids based on PHA working drawings and site specifications. The lowest bidder is awarded the contract.	
5. The housing is constructed according to the winning design.	Monitoring of housing begins to measure energy use.

Figure 2 compares the two methods as they related to the design competition.

FIGURE 2

PROS AND CONS OF TURNKEY AND CONVENTIONAL BID

	PROS	CONS
Turnkey	<ol style="list-style-type: none"> 1. HUD regulations favor this method of construction. 2. Traditionally, it is a quicker method of construction because the site is made available by the developer. 3. Developers are usually experienced in this type of construction, as they often reuse plans. 4. The turnkey program would require only minor modification to adopt to conservation design competition. 5. Factors other than cost are considered in choosing the developers. 6. American Society of Registered Architects considers them to be design competitions. 	<ol style="list-style-type: none"> 1. Designs are often unoriginal. 2. Architect plays a junior role. 3. AIA does not consider them design competitions. 4. At times, all the developers' proposals have been deemed "unresponsive," and the possibility of this happening is present.
Conventional Bid	<ol style="list-style-type: none"> 1. Traditionally, more original designs have resulted from bid. 2. AIA would consider it a design competition. 3. Architects are directly involved. 	<ol style="list-style-type: none"> 1. Often slower process of construction than turnkey. 2. Current program would require minor modification. 3. HUD is not encouraging the use of bid construction.

Major issues involved in the choice between turnkey and conventional bid is the fact that in turnkey the developer will have to be the source of design innovations. Whereas in conventional bid, the architects are the source of the designs. In addition, in turnkey the competition already exists whereas under bid, competition will have to be interjected.

FRAMEWORK OF THE DESIGN COMPETITION

The DOE, in conjunction with HUD, will have to determine:

- the number and location of units to be built under the competition;
- the energy conservation design and evaluation criteria (i.e., active or passive solar, heating and cooling, etc.); and
- the acceptable tradeoff between desired energy savings and the size of the cash contribution to the PHA to cover increased capital costs (e.g., a ceiling cash contribution per unit, a cash payment to achieve a minimum energy savings, a maximum acceptable pay back period, in utility cost savings).

Recommendations

If the BCS decides to pursue the option of using public housing as the vehicle for the design competition then it must:

1. Coordinate with HUD. The BCS would establish formal and informal lines of communication with HUD's offices under the Assistant Secretary for Policy Development and Research and the Assistant Secretary for Housing Management.

2. Solicit the cooperation of the AIA, NAHB, NAHRO, etc. for the planning and execution of the design competition.

TABLE OF CONTENTS

	<u>Page</u>
Introduction	1
Objectives and Project Requirements	2
Study Approach	3
Public Housing as a Vehicle for an Energy Design Competition	5
Public Housing Energy Conservation Design Competition Options	7
Option 1: Using the Turnkey Method of Development	7
Option 2: Using the Conventional Bid Method of Development	10
Comparison of Design Competition Under Turnkey and Conventional Bid	10
1. The Role of the Registered Architect and the Developer	12
2. Evaluation Methods	12
Framework of the Design Competition	14
The Next Steps: Recommendations	17
<u>Appendix 1</u> Discussion of Past Design Competitions and Awards Programs	
National Student Design Competition in Energy Conscious Design, The American Institute of Architects Research Corporation and the Federal Energy Administration	1-1
Owens-Corning Fiberglas Energy Conservation Awards	1-7
1976 Solar Dwelling Design Competition, The American Institute of Architects Research Corporation and the Exxon Corporation	1-11
Department of Defense Research and Demonstra- tion Program	1-15

	<u>Page</u>
<u>Appendix 2</u> Individuals and Organizations Contacted	2-1
<u>Appendix 3</u> References	3-1
<u>Appendix 4</u> Major Points Made in Conversation by Housing and Architectural Authorities in Response to Energy Conservation Design Competition Programs	
Raymond Hamilton, Director, Public Housing, HUD	4-1
Tom Vaneer, AIA Research Corporation	4-2
Paul Meussig and Donald Carr, National Association of Home Builders	4-4
Mary K. Nenno and Eugene C. Scheider, National Association of Housing and Redevelopment Officials	4-5
<u>Appendix 5</u> Federally-Assisted Housing Programs Considered for Use in a Design Compe- tition	5-1
<u>Appendix 6</u> Historical and Current Public Housing Operations	
History and Administrative Framework	6-1
Profile of Public Housing	6-2
Public Housing Financing	6-3
Comparison of Operating Expenses Between Public Housing and Privately Owned Apartments (Figure 1)	6-7
Income and Expenses of Public Housing Units in Management: 1966-1972 (Figure 2)	6-8
Trend in Federal Operating Subsidy: 1962-1974 (Figure 3)	6-9
<u>Appendix 7</u> HUD's Legislative Mandate to Promote Conservation in Public Housing	7-1

INDEX OF TABLES

<u>No.</u>	<u>Title</u>	<u>Page</u>
1	Turnkey Method of Development and Design Competition Changes	8
2	Conventional Bid Method of Development and Design Competition	11
3	Pros and Cons of Turnkey and Conventional Bid	13

STATUS OF CONSERVATION DESIGN COMPETITION

Introduction

A primary concern and responsibility of the Department of Energy is to ensure that its research and development efforts are eventually carried into the private marketplace. Widespread commercialization of energy conserving technologies and techniques often requires more than sound engineering and beneficial economics. First, the private sector must be made aware of the advantages and opportunities of new conserving practices. Second, it must feel confident that the practices will economically accomplish desired results, i.e., that the conserving options are reliable and have demonstrated their cost-effectiveness. Third, the avenue for implementation and adoption must be unimpeded by serious barriers such as legal constraints or institutional obstacles (e.g., lack of suitable financing arrangements or existence of inhibiting building codes). In general, all three of these steps must be accomplished before new technologies or processes can be widely accepted by the private sector.

Many energy conserving techniques and technologies for buildings have been developed and demonstrated and are now at the stage where widescale commercialization could take place. A number of alternative policies exist at the federal level to promote commercialization. One such policy action, the building design competition, is the subject of this study.

The purpose of this report is to present various programmatic options for BCS to use in utilizing a building design competition as a mechanism to promote the widescale adoption of energy conser-

vation in new building design. The design competition is expected to 1) increase the awareness of architects, builders, and the public about the opportunities for incorporating energy conservation in buildings; 2) to result in a building which demonstrates that these conservation measures are compatible with traditional living patterns and overall building and operating costs; and (3) to serve as a model for the widescale introduction of energy conservation design in a broad range of residential buildings.

Objectives and Project Requirements

Preliminary background discussions between DHR and the Department of Energy's Conservation Building and Community Systems (BCS) Division resulted in an agreement which defined several possible general program requirements for a conservation building design competition. These were that: (1) the design competition focus on the multi-family low-rise residential market; (2) the design competition would result in the construction of a building or buildings under a federally-assisted housing program; (3) the competition would be among competitors who are professional architects, designers and/or developers; (4) the design competition would generate a high degree of public and professional awareness of conservation options in building design; and (5) the competition would be based on the use of a common standard of judgement (e.g., Btu's per square foot).

The purpose of the initial phase of this study has been (1) to assess the feasibility of developing a design competition

that can meet the general requirements, (2) to identify potential program options for the competition, and (3) to develop a preliminary structural framework for it. This paper reports the study approach and our preliminary findings.

Study Approach

Given the above general requirements, we reviewed the literature of design competition and awards programs (Appendix 1), interviewed the sponsors of previous programs (results in Appendix 2), talked extensively with HUD personnel involved in the areas of public housing and energy conservation in buildings, and discussed the project with professional architecture and builder organizations including the American Institute of Architects (AIA), National Association of Home Builders (NAHB), National Association of Housing and Redevelopment Officials (NAHRO), Society of American Registered Architects (SARA) and many others (Appendices 3 and 4). We attempted to define a feasible design competition, to eliminate options that did not satisfy BCS general requirements, to identify potential obstacles to competition implementation, and to determine the roles for the many actors that would have to be involved in order to successfully accomplish the design competition.

The first step in our research was to examine all major federally-assisted housing programs. Appendix 5 shows the programs that were reviewed. Our goal was to find housing programs that: (1) could be used to satisfy BCS requirements for a design competition; (2) could be integrated into such a competition with a minimum modification; (3) that would minimize the time between

initial planning and construction; and (4) that would leverage DOE funds.

Initial screening eliminated all but four of the options because in our view they would not satisfy the general BCS requirements. The remaining four after our initial screening were Department of Defense (DOD) housing, HUD supported housing under Section 8, and two options under HUD's public housing program. After further consideration both Department of Defense and Section 8 Housing were eliminated.

Department of Defense housing was rejected for the following reasons:

1. The program is relatively small now--i.e., in 1978 DOD will build 958 units; 1,459 in 1979--and the number of new units is projected to stay small through 1982, 1000-4000 units per annum.
2. The program focuses on townhouses and single family detached units.
3. DOD staff has indicated that energy conservation is already a prime consideration its program and that an energy conservation design competition would be "redundant."

We rejected Section 8 housing on our second screening because:

1. The program does not allow for control of the design of the multifamily housing units. Housing authorities, using HUD funds, guarantee tenant rent payments to private developers and operators. Beyond assuring compliance with HUD minimum property

standards, the housing authorities exercise little control over building design.

2. This lack of control, coupled with private sector profit considerations, inhibits the use of innovative, energy efficient, building design.

The final two options involve the use of the public housing program. We believe that they offer the greatest probability of achieving BCS general requirements without disrupting HUD programs.

Public Housing as a Vehicle for an Energy Design Competition

Our research and analysis has identified a number of features of the public housing construction program which make it an excellent vehicle for a design competition. These features are listed here and discussed throughout the text.

1. No major programmatic changes would be necessary to incorporate energy conservation design criteria into the existing public housing construction process.
2. The time between program start-up and construction could be relatively short. Construction on innovative designs could begin as early as mid-FY 1979.
3. Approximately 40,000 new public housing units will be constructed in FY 1979--most of these will be in multifamily low-rise buildings.
4. The design competition could provide a large amount of leverage for DOE funds because the major DOE expense probably would be to pay for the incremental capital cost of the energy conservation equipment and

the added cost of the energy efficient building construction. The great major of the building costs would be financed as usual by the FHA and HUD. (See Appendix 6.)

5. Designs developed in the public sector would be considered credible and legitimate by the private sector because low-rise multifamily public housing is similar in first cost, operating expense and construction design to comparable housing in the private sector.
6. Technology innovations have flowed freely between the two sectors. For example, the technology for the mass production of roof trusses, which is currently used in the private sector was developed for Operation Break-through. Moreover, many developers who specialize in public housing construction often build similar housing for the private market.
7. Once constructed, the buildings could serve as energy conservation operating demonstrations in buildings. Monitoring could be incorporated into the competition. It would demonstrate the amount of energy and economic savings achievable using design and operating procedures.
8. Unlike most other federally-assisted housing programs, energy conservation considerations can be incorporated into the earliest planning stages of the building development process in public housing.
9. HUD has the legislative authority to fund research to develop improved technologies, methods and materials

to reduce costs in public housing. In addition, HUD's Minimum Property Standards promote energy conservation in public housing. (See Appendix 7.)

10. HUD is concerned with reducing PHA utility costs because they represent a significant portion of HUD subsidies toward public housing operating expenses. The energy efficient designs developed for the competition could provide a demonstration of effective approach to managing increasing energy costs for all new public housing. (See Appendix 6.)

Public Housing Energy Conservation Design Competition Options

Public housing is generally constructed either by the turn-key or the conventional bid development method. The options for the design competition rely on the structural elements of these two construction methods.

Option 1: Using the Turnkey Method of Development (See Table 1.)

Under the turnkey method, the local public housing authority (PHA) applies to HUD for a program reservation for a specific number of housing units. The application to HUD serves as official notification that the PHA intends to build public housing, as described in the application. The grant of a program reservation by HUD has the effect of locking in federal funds for subject development. Once the program reservation has been issued, the project along with the design criteria and functional objectives is publicly announced by the PHA. The Developer's

Table 1

TURNKEY METHOD OF DEVELOPMENT
AND DESIGN COMPETITION CHANGES

<u>Usual Sequence</u>	<u>Design Competition</u>
1. The PHA applies to HUD for a program reservation for a desired number of units with specific functional objectives and design criteria.	Energy conservation is incorporated as an important design criterion in conjunction with DOE and HUD.
2. HUD grants the program reservation. The project is publicly announced and a "Developer's Packet," which includes design criteria and application forms, is distributed to interested developers.	Energy conserving design criteria are included in the Developer's Packet. A project site is pre-selected by the PHA.
3. Developers submit building design proposals and cost estimates.	
4. Competing proposals are judged by the PHA in conjunction with the HUD field office. One developer is selected as the contractor.	The evaluation criteria stress energy conserving design. Judging is performed by conservation experts selected by DOE and HUD in conjunction with PHA officials.
5. Construction is undertaken.	
6. Upon approval of the completed building the PHA buys the housing units from the contractor. The contractor turns over the keys to the PHA.	DOE begins monitoring building energy use.

Packet, containing the design criteria and functional objectives, is made available to qualified developers. The packet contains information about the total number of units, the number of bedrooms per unit, the housing type and the kinds of units (i.e., family, large family or elderly). In addition, site layout and open space requirements (e.g., parking and outdoor recreational facilities) are specified where necessary. Other special requirements for the project are also included.

Proposals are then accepted from qualified builders and judged according to evaluation criteria established by the PHA. The PHA, with the concurrence of the HUD field office, selects one contestant as the contractor. The purchase price is fixed at a negotiation conference. Upon completion of construction, the PHA buys the units from the developer at the agreed upon price. In effect, the developer turns the keys over to the PHA.

A conservation design competition could be incorporated into the turnkey method of development without any major changes to its present structure because a design competition already exists. The primary modification would be that energy conservation would become a primary design concern. Conservation design criteria would be added to the developer's packet and evaluation criteria stressing conservation would be required in the judging process. Judging would be conducted by the PHA as usual in conjunction with a special committee of Department of Energy representatives familiar with energy conservation design in buildings. The DOE role in this type of competition is discussed below.

Option 2: Using the Conventional Bid Method of Development
(See Table 2.)

The conventional bid method of development is used only in the event that turnkey is proven to be clearly an inferior development method.* As in turnkey, the PHA applies to HUD for a program reservation. Once granted, the PHA contracts the services of a registered architect. This is seldom done on the basis of a design competition although the PHA has the option to do so. The architect, in conjunction with the PHA and the HUD field office, plans, designs and estimates the cost of the project. After the plans have been approved by the HUD field office, the project is publicly announced. Information packages are made available to interested parties. The construction contract is awarded to the lowest qualified bidder.

A conservation design competition could be incorporated into the conventional bid method by simply requiring that the architectural design be the focus of the competition. The winning design would be the basis for builder bidding. The designs would be evaluated on the basis of criteria developed by the Department of Energy and HUD. Judging would be performed by the PHA and a committee of special Department of Energy and HUD representatives. The contract for construction would be bidded out to builders in the usual manner.

Comparison of Design Competition Under Turnkey and Conventional Bid

There are several differences between turnkey and conventional bid design processes which could be of importance to DOE and HUD in evaluating either method for use as a vehicle for an energy conservation design competition. These differences include:

*Public Housing Development Handbook, U.S. Dept. of Housing and Urban Development. Chapter 8, Section (a) Page 8-1.

Table 2

CONVENTIONAL BID METHOD OF DEVELOPMENT
AND DESIGN COMPETITION CHANGES

<u>Usual Sequence</u>	<u>Design Competition</u>
1. The PHA applies to HUD for program reservation for a desired number of units with specific functional objectives design criteria.	Energy conservation is incorporated as important design features.
2. HUD grants the program reservation. The PHA selects an architect to design the project and estimate total development costs.	The selection of the architect and building design is based on a competition stressing conservation design.
3. The PHA publicly announces the housing project; interested contractors are sent an information package which includes the winning design.	
4. Developers submit bids based on PHA working drawings and site specifications. The lowest bidder is awarded the contract.	
5. The housing is constructed according to the winning design.	Monitoring of housing begins to measure energy use.

1. The Role of the Registered Architect and the Developer.

Under the bid method, the architect is a lead actor who works closely with the PHA and the HUD field office throughout the planning and implementation phases. It is the architect's design, agreed to by the PHA, upon which developer's bid. Under the turnkey method, however, the architect plays a secondary role to the developer. This is because designs are selected by potential developers. Such designs are usually standard, off-the-shelf plans, (to reduce costs), and are modified to meet specific site and functional requirements.

2. Evaluation Methods.

The method of evaluation in final selection vary considerably under turnkey and bid. Under conventional bid, the lowest bidder is awarded the contract to build a predetermined design. With turnkey, design and construction proposals are judged according to how well they conform to the numerous criteria which are detailed in the developer's packet. The proposal that best conforms, within a specific cost range, is selected.

Table 3 is a matrix of the pros and cons of a design competition under either turnkey or conventional bid. It is important for DOE to recognize that in turnkey the burden of innovation will be placed upon the developer and the team he assembles. In conventional bid, the source of innovation is the architect. No decision at this stage has to be made as to which development option is preferred. In fact, our findings indicate that both have strong advantages depending on which PHA conducts the

Table 3

PROS AND CONS OF TURNKEY AND CONVENTIONAL BID

	PROS	CONS
Turnkey	<ol style="list-style-type: none"> 1. HUD regulations favor this method of construction. 2. Traditionally, it is a quicker method of construction because the site is made available by the developer. 3. Developers are usually experienced in this type of construction, as they often reuse plans. 4. The turnkey program would require only minor modification to adopt to conservation design competition. 5. Factors other than cost are considered in choosing the developers. 6. American Society of Registered Architects considers them to be design competitions. 	<ol style="list-style-type: none"> 1. Designs are often unoriginal. 2. Architect plays a junior role. 3. AIA does not consider them design competitions. 4. At times, all the developers' proposals have been deemed "unresponsive," and the possibility of this happening is present.
Conventional Bid	<ol style="list-style-type: none"> 1. Traditionally, more original designs have resulted from bid. 2. AIA would consider it a design competition. 3. Architects are directly involved. 	<ol style="list-style-type: none"> 1. Often slower process of construction than turnkey. 2. Current program would require minor modification. 3. HUD is not encouraging the use of bid construction.

competition. For example, almost all public housing experience in the western portion of the U.S. has been with the turnkey method. In the east, however, conventional bid has been popular. Where a PHA has a relatively small staff then turnkey might be preferred because the construction process requires fewer administrative check points.

The turnkey development method replaced conventional bid because HUD believed that more desirable site options would be available and the entire development process would be accelerated. This has not always been true; therefore, one requirement in the selection of the PHA would be that a pre-selected site be available. This would eliminate the site-based advantage of any single developer. In summary, the development method--either turnkey or bid--would be selected to suit the specific PHA. Indeed, one possibility is to sponsor two competitions; one based on each method.

Framework of the Design Competition

The design competition discussed below is premised on DOE agreeing to pay the incremental cost of building public housing units which exceed HUD minimum property standards (MPS) and which are more energy efficient than units which simply conform to current MPS. DOE and HUD will have to determine the number and location of units to be built under this competition and the tradeoff between the increased initial capital costs to be paid for by DOE and the expected energy savings to be obtained in actual operation by the PHA as a result of these higher first costs.

The key steps in the plan are discussed below. They are by no means complete, and many details remain to be worked out with organizations having an interest in the competition such as HUD, NAHRO, etc. Other details must be decided within the DOE such as the nature of the conservation design and evaluation criteria.

DOE and HUD must cooperatively work to accomplish the following steps.

1. A PHA is selected as the location for the design competition. The PHA must have a HUD program reservation and a pre-selected building site. In addition, the PHA must be willing to fully cooperate. The National Association of Housing and Development Officials (NAHRO) and HUD field offices could assist in the selection process.
2. The format of the design competition would be determined by the development method specified in the program reservation:
 - If the development method is turnkey then energy conservation design criteria would be incorporated into the Developer's Packet. The design competition would be similar to traditional turnkey design competitions, except for the conservation factor. Developer's would be required to submit detailed building designs and cost estimates. Energy conservation would be stressed in the designs.
 - Alternatively, under conventional bid, the competition would be among architects who would submit building designs that meet all program

reservation functional objectives and stress energy conservation. Similar energy conservation design criteria could be used for either competition.

3. The competition judging would be performed by a select committee of individuals appointed by the DOE and HUD in cooperation with the PHA. Evaluation would consider functional objectives but would stress energy conservation. Judging could be based on a point system weighted toward conservation.
4. The competition winner would be awarded the contract to design and/or construct the building. In addition cash prizes and achievement awards might be given to the winner and runners-up to compensate them for their special efforts in competing.
5. The energy use in the buildings would be monitored over at least a one year cycle. The results could be used for additional public relations purposes as well as to guide HUD and private developers.
6. Public relations would be an important factor through all phases of the competition. The AIA, NAHB and NAHRO publish influential trade journals, therefore, cooperation with them would provide access to the architectural and building trades. Other media coverage also could be pursued.

The Next Steps: Recommendations

If BCS accepts public housing as the vehicle for the design competition then the following steps must be taken:

1. BCS must establish lines of communication with HUD.

This can be accomplished first through informal discussions and then more formally with agreement on both sides to cooperate. The HUD offices having authority to participate in programs of this nature are the Assistant Secretary for Policy Development and Research and the Assistant Secretary for Housing Management. Preliminary, informal contacts with these offices have already been initiated during our background discussions. The Director of Public Housing has also been contacted. The next round of discussions with these offices should stress implementation.

2. The DOE in conjunction with HUD should decide what kinds of conservation design options should be included in the competition:

- Should passive and/or active solar applications be included?
- Should the energy efficient technology be off-the-shelf, state-of-the-art or go beyond the state-of-art?
- Should HVAC be the prime consideration or should hot water and cooling be considered?

Interviews with the AIA, the NAHB and NAHRO have provided insight on these questions. Our discussions suggest that a radical departure from standard building practices (e.g., complex active solar technology) might

discourage PHAs, architects and developers from participating in a design competition that already has inherent risks.

PHAs are concerned with preventing any delays in completing the construction of their public housing project.

A competition that relied on the use of technology still in the development stages would threaten the timeliness of the project and probably inhibit PHA participation.

- PHAs might balk at the possibility of having to pay the long-run maintenance cost of an energy technology that has not satisfactorily demonstrated its reliability over a long time period.
- Architects and developers are motivated to compete in the development process by the chance that they will win the contract and make a profit. A competition whose requirements appear to be highly complex and unusually esoteric may be viewed by the architect or developer as too risky to undertake for the following reasons:

- 1) First, there is an added expenditure in the design phase.

- 2) There is the uncertainty that the actual building construction would stay within budget.

These factors suggest that a design competition that would meet the least resistance would likely be limited in scope to proven technologies and design practices.

Previous successful conservation building awards programs have stressed the innovative combination of known technology with "thoughtful" building design. (See Appendix 1.)

This is difficult to define. In general it encompasses building orientation that takes advantage of solar and climatic conditions, landscaping for shading, etc.

The design criteria should be developed in cooperation with the organizations mentioned above--the AIA, NAHB, NAHRO, SARA--and representatives of PHAs and public housing developers.

3. The DOE will have to determine how it will set the upper limits of its subsidy to the PHA to pay for the differential in capital costs between the energy conservation design and the units which merely comply with HUD's minimum property standards. In general, DOE will have to determine the acceptable tradeoffs between the energy savings goals and initial capital costs. A number of options exist, including:

- DOE could establish a maximum cash contribution per unit and accept the design offering the greatest estimated energy savings.
- DOE could set a minimum acceptable energy savings per unit (or per square foot) and accept and pay for the least costly design achieving this goal.
- DOE could determine a maximum acceptable pay-back period (e.g., 10 years) for energy conservation features over and above MPS standards and pay the differential between MPS and energy conserving designs which promise pay back within this period up to a fixed dollar amount.

- DOE could establish a life cycle cost basis and accept the design which offers lowest life cycle costs. DOE would have to determine whether or not to set a maximum initial capital cost subsidy in such a program.

APPENDIX 1

National Student Design Competition in Energy Conscious Design

The National Student Design Competition of 1976 was sponsored by the Federal Energy Administration in coordination with the AIA Research Corporation. Its objective was to stimulate student involvement in combining energy conscious design with the traditional objectives of occupant comfort, environmental integrity, and building economy. The AIA/RC staff was responsible for the major organizational and managerial efforts involved in running the competition.

The student portion of this project involved a national competition in energy conscious design among professional schools of architecture. The objectives enumerated in the AIA/RC publication, New Design Concepts for Energy Conserving Buildings were to:

- Lend recognition and support to efforts by architectural students and faculty to incorporate energy concerns in their work;
- Bring energy consciousness into the design process as it is taught, learned and practiced in architectural curricula;
- Serve as a vehicle for introducing energy-related resource material to architectural design courses;
- Provide a means and a focus for an exchange of information and a sharing of knowledge among participants, both students and teachers, primarily through publication of all competition entries; and
- Serve as an assessment of the range and depth of endeavors related to energy conscious design in schools of architecture.

The competition was open to all students enrolled in a design workshop or studio course within a professional architecture school. No specific studio problems were required, although the AIA outlined one option for the faculty to use if they so desired. This was to design a Community Resource Center. Over 40 percent of the entries used this problem, four of which were selected as Entries of Distinction. It was suggested that the Community Resource Center be planned as "a marketplace for community information" where activities and services are provided, materials may be borrowed, information and referrals are exchanged and a place for people to gather. The physical facilities were to include 1) an administrative area for offices, 2) a multi-purpose function room, 3) a preschool learners center, 4) a library (stacks for 50,000 volumes), 5) a sales and exchange area, and 6) a public exhibition space.

The suggested energy conscious design criteria which could be applied to the Community Resource Center or any existing studio problem included the following:

1. Space planning to be reasonably related to client needs.
Indoor activity programs to use less floor area than is now considered standard.
2. Natural daylight to be used where possible for activities requiring light.
3. Concentration of activities that have similar temperature, humidity, air circulation and light requirements. Consideration of separate zones for their control.

4. Site conditions, such as variations in grade, landscaping, surfaces and adjacent structures to be a major factor in building location.
5. Protection of openings and glazed areas from unwanted exposure to sun in the summer, but allowing for solar gain in the winter by locating them on different sides of the building and by shading or sheltering them architecturally.
6. Natural ventilation for cooling where possible. Consideration of ways to store cool night air in the building during summer days, or hot air during winter nights.
7. Conservation of resources in the design or operation of the building; recycling elements wherever possible.
8. Use of mass where it can relieve the need for mechanical intervention.
9. Accommodation of alternative energy sources, such as sun and wind power for heating, cooling and electricity where possible.
10. Estimation of the probable first cost increases, or savings, that energy conscious design has made in the cost of the design solution. Consideration of life-cycle cost implications.

Officials from the Review Board agreed that the project was successful in achieving its objectives--especially in serving as a vehicle for introducing energy related resource material to architectural design courses. The competition sparked a lot of enthusiasm in the design area resulting in a need for more energy conserving concepts to be integrated into the architectural curricula.

Fifty five schools participated, submitting one hundred and fifteen entries which were reviewed by the competition's National Review Board on June 23, 1976. The schools developed their own procedures for internal evaluation of the entries. As only three final submissions were allowed from each school, a preliminary screening process was necessary. The National Review Board chose the most outstanding entries based on the process by which the competition was conducted at each school. Participants agreed that the package of guidelines presented to the students was clear as evident in the submissions where most issues were addressed.

The National Review Board met for two days to select twelve entries of distinction out of a possible one hundred and fifteen submissions. The members included Jean J. Boulin of the Federal Energy Administration; Fred S. Dubin of Dubin-Bloome Associates, New York, New York; Sarah P. Harkness (AIA) of The Architects Collaborative, Cambridge, Massachusetts; Philip J. Meathe (FAIA) of Smith, Hinchman & Grylls Associates, Inc., Detroit, Michigan; Bradford Perkins of Llewellyn-Davies Associates, New York, New York; Anita Picozzi, Graduate Student at the University of Virginia, Charlottesville, Virginia; Lynda Simmons of Phipps Houses, New York, New York; Thomas Vreeland, Jr. (AIA) of Kamnitzer, Marks, Lappin, Los Angeles, California; and Henry Wright (AIA) Editor, Author, New York, New York.

The judgmental criteria was highly subjective as is typical in most design competitions. This is due to the number of designs submitted and the time and expense involved when convening a panel of experts. An official from the FEA explained that if a similar

competition were to be repeated that the same degree of subjective criteria would have to be used. However, as the jury focused on energy use and consisted of many experts in the energy field, he believed that the panel's deliberations were fair and quite reasonable.

Follow-Up

The preliminary submissions were displayed at the annual AIA convention. The final entries were recognized in three or four publications. The AIA/RC published the results of the competition in their book, New Design Concepts for Energy Conserving Buildings, which also included all 115 entries. No direct awards were given to the competition winners, however recognition by professionals in the field was considered valuable to students embarking on a career.

Public awareness of the competition and press coverage was minimal. However, publicity was not one of the program's objectives. The cost of the entire project is estimated to have been between sixty and seventy thousand dollars.

Administrative Pitfalls

The program coincided with the school semester and therefore insufficient time was available for administrative efforts. There were difficulties in disseminating the information. The managerial staff could not deal directly with the participating students. Thus, the information was sent to the department head. Contact with faculty often proved difficult and there was no guarantee that the information was distributed to the department members.

Participating FEA jurors and project organizers agreed that if such a competition were to be conducted again, the initial contacts and information distribution would have to begin considerably earlier--to ensure better communication, information channels, and more efficient administrative procedures.

Conclusion

It is important to recognize that this competition achieved its objective to "get the problem on the table," to bring energy consciousness into the design process as it is taught and practiced in architectural curricula. However, it is not possible to measure the effective changes in architectural student programs as a result of the competition.

Follow-up efforts, publicity and public interest were minimal. Student response was enthusiastic due to valuable recognition by professionals.

Construction and economic factors were not an integral part of the judgmental criteria. The emphasis was on innovative design in energy consciousness rather than direct building construction application. There were no intentions to pursue construction of the designs submitted. For the objectives stated above, the competition served quite well for students.

OWENS-CORNING FIBERGLAS ENERGY CONSERVATION AWARDS

The Owens-Corning Awards Program which was initiated in 1972 honors architects and engineers who, through creative efforts, incorporate energy efficiency into their building designs and mechanical systems. The primary objective of this program is to encourage an awareness of the need to conserve natural resources, and recognize those registered architects and professional engineers who have contributed to this goal.

Eligibility

Eligibility is restricted to architects and professional engineers. Individual entries are acceptable although most have been submitted by a team consisting of architects and engineers. Building projects must fall into one of the following stages of development at the time of entry to qualify for the awards program: 1) completed, 2) under construction, 3) commissioned and being designed.

The program is annually announced in the April issue of The Architectural Record and The AIA Journal. Usually two hundred to three hundred interested parties submit preliminary applications. The Owens-Corning project manager contacts all initial applicants to determine the approximate number of participants that will follow through with final submissions. Entries have been increasing at the rate of twenty to thirty percent annually. The 1977 competition drew one hundred entries.

Classification

Entries are judged in one of five building categories: institutional; commercial; industrial; governmental; and special (new or existing buildings, projects or complexes that are not included in preceeding categories).

Jury Selection, Judgemental Criteria and Procedure

The jury normally consists of six architects, engineers, and educators. Entrants are required to submit an in-depth explanation of the project's energy conserving features, (e.g., solar, heat recovery), cost of energy saved, systems cost and expected amortization, and an in-depth energy utilization summary which includes the envelope, ventilation, lighting load, interior fixed load, heating load, cooling load, process load, initial cost, and return on investment.

Judging

The criteria are weighted to emphasize energy conservation as the most important design element. "Significance to energy conservation" is rated the most important. Originality, creativity, and overall economy are next in value. Overall presentation, aesthetics and function are the least important design criteria.

No set number of awards is established in advance. The number of awards granted is determined in the judging process. The jury can also single out those projects that are outstanding in one particular area but insufficient in others for special mention. The winners are selected in mid-September when the jury meets for three or four days for the evaluation process. As the number of

entries increase annually, the judicial process requires more time and has become more expensive. Consequently, the project managers at Owens-Corning are considering a pre-screening process for future awards.

Awards and Follow-Up

The winners are notified no later than mid-October and awarded with a Steuben crystal sculpture. The announcement is made at a formal awards dinner to which all applicants are invited. Owens-Corning insures that the winners receive significant recognition by supporting major publicity efforts. The results of the awards program are published in a number of national trade and business periodicals including The AIA Journal, The Architectural Record, Design News, Industry, Energy Digest, Environmental Monthly, Solar Heating and Cooling, Electric Comfort Conditioning, Specifying Engineer, and several others. Moreover, results are published in local and some national newspapers.

Conclusion

The Owens-Corning program is an awards program. It recognizes achievement in energy-conscious design after the project is completed, under construction, or commissioned. While it does not encourage experimentation or innovation in energy-conscious design and construction techniques, it awards those who have successfully incorporated marketable energy conservation features into their architectural plans.

The program serves as an effective public relations tool for Owens-Corning, who is a corporate leader in energy conservation products. It also provides the company with many important contacts

in the building/construction and architectural industry; in addition, it provides the winners with invaluable recognition.

The program is estimated to cost Owens-Corning between 200-250 thousand dollars. On the other hand, the competition related costs to the architectural and engineering firms are estimated to run from one to four thousand dollars.

There is a fundamental weakness in the judging procedure. It is not possible for the jurors to visit construction sites or to monitor the design elements which have been incorporated into the architectural program. Therefore, they must rely on the energy calculations provided by the contestants as well as their own computations to measure the degree of energy savings.

1976 Solar Dwelling Design Competition

The goal of this competition was to provide a forum for innovation in solar design and to engage a large number of architectural students and faculty in the design process. The program asked students to reduce reliance on fossil fuels, and to integrate solar energy for space heating, cooling and domestic hot water into their housing design. The competition stressed the regional aspects of solar design calling for housing sensitive to climatic variations such as the sun's movement, amount of sunlight, humidity, temperatures, cloud cover, wind speeds and directions, precipitation and the fluctuations of each. Additionally, each design had to demonstrate its market value for a particular buying group: single adults, young couples, growing families, extended families, the elderly and cooperatives. The competition was sponsored by the AIA Research Corporation and supported by an \$80,000 grant from the Exxon Corporation.

Elements of Design Competition Structure

Participating schools were sent a package including an introduction to the competition, a definition of the problem, competition guidelines, climatic considerations, entry forms, bibliography, and reprints on "Solar Energy and Housing" (AIA/RC) and "Intermediate Minimum Property Standards for Solar Heating and Domestic Hot Water Systems."

The competition was open to students enrolled in a design workshop or studio course within professional schools of architecture in the U.S. and Canada. Other interested students were considered eligible if sponsorship by a faculty member had been secured. Two thousand students submitted entries.

Each school was allowed to submit as many as four entries for consideration by a National Review Board. The preliminary screening process was left to the discretion of the individual school. It was recommended that the projects represent the best possible combination of design excellence and use of solar energy.

The specific problem focused on single-family housing. The students were required to submit calculations of life cycle costing of various design features. The scale was optional (i.e., any number of dwellings). They could be attached or detached and arranged in any manner such as townhouse or cluster. The package included a recommended range of dwelling sizes within each buyer group to reinforce the emphasis on affordable homes for "typical people" and to discourage upper-middle and high-income house designs.

Judgmental Procedure and Criteria

The National Review Board was made up of representatives from various fields including architectural engineering, education, housing and solar industries and consumer concerns.

The evaluation criteria used by the jurors were relatively unspecific. To facilitate the decision process, the criteria provided a conceptual framework which emphasized application of energy principles and response to climatic conditions into an architectural solution. However, as is true in most design competitions, the judging was primarily subjective due to the number of entries, and the time and expense of convening a panel of professionals.

The criteria used by the National Review Board included the following:

- Innovative design
- Application of the principle that people--not houses--use energy
- Sensitive response to local climatic conditions
- Integration of energy concepts and technology into an architectural solution
- Reasonable value and its justification for the buyer group.

Awards

Ten winners were chosen and awarded \$500 cash prizes. The winning designs were given national recognition in the AIA Research Corporation's Solar Energy Exhibit at the AIA annual convention. Results were published in 46 national newspapers across the United States and published in AIA/RC's Capturing the Sun: Designs from an Architectural Student Competition.

Conclusion: This competition proved successful in spawning new ideas, techniques and concepts in architectural design. However, representatives from the Exxon Corporation conveyed their disappointment in the program because it failed to emphasize economic considerations in the building design. While Exxon had little influence on the judgmental criteria, they urged that the jury include a professional builder to represent a crucial interest and consideration in the design process. The objectives of the compe-

tition did not include construction of a building. However, Exxon representatives maintained that the designs submitted illustrate the weakness in business and economic background in the architectural curricula. Although the intent was to produce designs for mass housing, implying uniform, comparatively inexpensive construction techniques, the designs displayed unique construction as well as unique siting features. Despite these misgivings, the general response from Exxon representatives was favorable because the competition generated a lot of interest in solar energy. However, they recommend that future programs require more precision in the design criteria. The next competition will probably be aimed at professional architects and builders.

Department of Defense Research and
Demonstration Program

Under the legal umbrella of the 1977 Military Construction Authorization Act and the Solar Heating and Cooling Act of 1974, the Department of Defense is actively engaged in research and demonstration of energy conservation in military building design and construction. The Solar Heating and Cooling Act provides that much of the funding for these demonstration projects should come from the Department of Energy.

The DOE-funded military buildings have two purposes. The first is to test the designs for efficient solar power systems. The second is to indirectly stimulate the growth of the solar industry by demonstrating its cost effectiveness to the private sector. The most recent example is a base exchange which is being built at Randolph Air Force Base in Randolph, Texas. The exchange is nothing more than a mini-shopping center which depends on solar techniques for heating and cooling purposes. DOD wants to demonstrate its usefulness and practicality to the private sector, in the hopes that it will be used in future shopping centers.

Additionally, DOD is doing solar demonstration work in military housing. The only existing solar quarters are at the Air Force Academy in Colorado-Springs, Colorado. Air Force engineers are monitoring the units in an effort to learn more about optimal solar design for future military housing, in various climates.

The demonstration involves two Air Force quarters of identical size, floor plan and orientation to the sun. Internal temperatures

are kept the same in both homes. Both homes have natural gas furnaces and a forced air heating system. The primary difference between the two is that one home uses natural gas as the primary source of heat energy, while the other uses solar, the latter using the gas only as a back-up system. Additionally, the solar home uses the sun's power to heat hot water.

In its first winter of operation, the solar home used 50% less natural gas than the other test homes. This year, with added insulation, it should do even better.

These impressive energy savings notwithstanding, the solar house is a long way from being cost-effective. But this is of little concern to Air Force officials. Their primary concern is to refine solar techniques for military housing purposes. They are pleased with the results to date and look forward to further refinement resulting from this demonstration project.

APPENDIX 2

INDIVIDUALS AND ORGANIZATIONS CONTACTED

<u>Individual</u>	<u>Organization</u>
Cley Wellborn	Library of Congress
Robert Hemphill	Mellon Institute
Andrew Euston	Department of Housing and Urban Development
John Holton	National Bureau of Standards
Allen Trellis	National Association of Home Builders
Paul Massig	National Association of Home Builders
Frank Spink	Urban Land Institute
Glen Andres	Middlebury College
Robert Peck	National Endowment for the Arts
Robert Sheehan	National Association of Home Builders
Daniel Quigley	Department of Energy
Robert Shibley	Army Corps of Engineers
Rose Gratlatroti	American Institute of Architects
Peter Smeallie	American Institute of Architects
Edward Janke	Janke Associates
Donald Carter	Carter Engineering
Dr. John Kohn	Owens-Corning Corporation
Dr. Louis Shrier	Exxon Corporation
Charlotte Flucarte	Exxon Corporation
Sharon Comey	Exxon Corporation
Jane Talliaferro	Department of Housing and Urban Development
William Phelan	Owens-Corning Corporation

Individuals and Organizations Contacted (continued)

<u>Individual</u>	<u>Organization</u>
Diann L. Stechulte	Owens-Corning Corporation
Roger Holiday	Owens-Corning Corporation
Carol Snypes	Department of Energy
Carol Norris	Department of Energy
Peter Back	Department of Energy
Jean Boulin	Department of Energy
Professor R. Dougald	University of Virginia
Fredrich Bentel	New York Institute
John Schade	University of Wisconsin
Dee Forlides	The Producers Council, Inc.
William Young	National Association of Home Builders
Lindy Carver	National Association of Home Builders
Marie Drissel	Department of Housing and Urban Development
Brian Putschem	National Association of Home Builders
Jerome Salzman	Society of American Registered Architects
Robert Dillon	National Institute of Building Science
Robert Diaiso	Dewberry, Nealon & Davis
Herbert Epstein	Epstein/Greenfield Architects
Mary K. Nenno	National Association of Housing and Redevelopment Officials (NAHRO)
Eugene C. Schneider	National Association of Housing and Redevelopment Officials (NAHRO)

APPENDIX 3

PUBLICATIONS, ARTICLES, TESTIMONY

- 1) Title III - Energy Conservation Standards for New Buildings
- 2) Report to the Congress by the Comptroller General of the United States, "Operation Breakthrough - Lesson Learned About Demonstrating New Technology"
- 3) "The Energy Conscious House," by Denis Hayes; Across the Board, December, 1977
- 4) Hearing before the Subcommittee on Buildings and Grounds, January 24, 1977. Testimony by: Roy Knight, Acting Director, Architecture and Environmental Arts Program, National Endowment for the Arts; John M. McGinty, FAIA, President, American Institute of Architects
- 5) Environmental Design Performance Evaluation Vol. 1 by the AIA Research Corporation for The Office of Policy Development and Research, The Office of Community Planning and Development, The U.S. Department of Housing and Urban Development, January, 1976
- 6) Urban Land Institute Briefing Paper, Topic: ULI Awards Program
- 7) Capturing the Sun - Designs from an Architectural Student Competition; c. 1977, AIA Research Corporation
- 8) New Design Concepts for Energy Conserving Buildings - Results of a National Competition Among Students in Schools of Architecture; c. 1976, AIA Research Corporation:
- 9) Title II - National Energy Conservation Policy Act

- 10) "Alaska: Capital Formation", Newsweek, January 16, 1978. p. 27.
- 11) Public Housing Development Handbook, U.S. Department of Housing and Urban Development, March 10, 1977.
- 12) Building and Construction Exposition and Conference, The Producers Council, Washington, D.C., 1977.
- 13) "Early Grading of Energy Use in Designs of Buildings Set as Aid in Writing Rules," The Wall Street Journal, James C. Hyatt, February 9, 1978.
- 14) Improved Human Environment Through Urban Renewal: Fourth Annual Design Competition Awards, The Ruberoid Company, New York, New York, 1959.
- 15) 1976 Owens-Corning Fiberglas Corporation Energy Conservation Award Winners Achieve Recognition, Owens-Corning Corporation, Toledo, Ohio, 1976.
- 16) Owens-Corning Fiberglas Energy Conservation Awards, Owens-Corning Fiberglas Corporation, Toledo, Ohio, 1977.
- 17) Record of Submissions and Awards Competition for Middle Income Housing at Brighton Beach, Brooklyn, The Housing and Development Administration, The Brooklyn Chapter of AIA, New York Chapter of AIA, New York, New York, 1968.

APPENDIX 4

January 16, 1978

Points Made by Raymond Hamilton
Director, Public Housing, HUD

1. Mr. Hamilton suggested that we try to incorporate energy conservation criteria into the Developer's Packet, prior to the competition's announcement. In this way, developers will be aware of these special design requirements well before proposals are submitted.
2. He advised us that we should attempt to make the design competition and the resulting building a "pilot project." Such a designation would expedite the entire process--from program reservation to actual construction. Moreover, this type of designation could possibly make HUD funds available for the additional design requirements.
3. This "pilot project" designation will require some policy decisions among pilots both at HUD and DOE. In effect, they will have to agree that energy conservation in future public housing, as a design criteria, is both desirable and practical, and that this method of introducing energy conservation, i.e., a design competition building construction, is the best way to achieve these goals.
4. He warned us that we may run into some problems in the area of prototype costs. This is because there will be no way to measure prototypical public housing costs, in any HUD region, given our proposed design criteria. Again, we will need senior HUD clearance on any variance from established procedures.
5. Hamilton believes that there will be in the area of 40,000 units started under the turnkey method in FY 1978.
6. He also pointed out that the AIA is against the turnkey method of construction. They feel that the architect plays a junior role to the developer using this method. In the conventional "bid" method, the architect plays a senior role and more or less tells the developer what he wants.

February 2, 1978

Points Made by Tom Voneer
AIA Research Corp.

1. Voneer was not optimistic about a design competition for low-rise multifamily housing. He said that there was marginal involvement of architects in that type of housing.
2. He said that the AIA does not consider turnkey construction to be a design competition and that there are strict ethical constraints which would discourage AIA members from participating in such a competition.
3. He suggested that we go back to BCS and try to get them to change the building type.

February 9, 1978

Points Made by Raymond Hamilton
Director, Public Housing, HUD

1. Hamilton would not comment on HUD's official position vis-a-vis getting involved with DOE in a design competition. He suggested we made contact with someone in the P,D&R section of HUD.
2. He stressed that we would have to get a "pilot" project designation to free up funds and cut back some of the inherent inertia a design competition would carry with it.
3. Hamilton pointed out that, contrary to earlier discussions, units were being built using the bid method of construction.
4. He pointed out that a design competition could be integrated into public housing construction using the bid method. In this case, the contest would be for the specific design. The winning set of design plans would then be "bidded" out to interested developers.

February 2, 1978

Points Made by Paul Meussig and Donald Carr
National Association of Home Builders

1. Carr was optimistic about the chance of having a successful design competition for public housing. He couched his optimism by saying that it would have to be structured in the right way.
2. He expressed preliminary NAHB interest but said he would like something in writing.
3. He saw several roles that the NAHB could play: direct, NAHB input on design criteria, their help in putting together the public announcement and the Developer's Packet, or their help in dispelling builder's fear of a program run by the federal government.
4. Carr suggested that we might get four or five proposals per PHA, among the 10 HUD regions.
5. He stressed that the building site would have to be pre-selected. Thus, all contestants would be working from the same site and design criteria could easily be structured around the site.
6. He felt that prizes above the award of the contract would be necessary to attract architects and developers.
7. Additionally, he suggested that prizes be given to the developer if in fact projections for energy consumption conservation were met, after a period of monitoring.

February 17, 1978

Points Made by Mary K. Nenno and Eugene C. Schneider
National Association of Housing and Redevelopment Officials

1. Schneider said that PHAs love competition and that we could expect a great deal of enthusiasm, especially if the benefits to the PHA were clear.
2. Ms. Nenno pointed out that a majority percentage of HUD's operating subsidies to PHA goes toward the payment of utility bills and that any cost-effective way to lower them would be well received by both the PHAs and HUD.
3. Schneider told us that turnkey was being given the big push because, traditionally, it required less time to get the housing units built under this method.
4. Ms. Nenno told us that public housing had been the proving ground for several building techniques which were later adopted by the private sector. She said she would provide us with magazine articles testifying to that effect.
5. Also, she said that the cost of public housing in the D.C. area, on a per unit basis, was comparable to private housing.
6. Ms. Nanno gave DHR the unofficial support of NAHRO and offered the services of her office.

APPENDIX 5

Federally-Assisted Housing Programs
Considered for Use in a Design Competition*

1. One- to Four-Family Home Mortgage Insurance
(Sections 203 (b) and (i))
2. Cooperative Housing
(Section 213, NHA, 1934)
(Section 114, Housing Act of 1950)
3. Multifamily Rental Housing
(Section 207, National Housing Act, 1934)
4. Multifamily Rental Housing for Low- and Moderate-
Income Families
(Sections 221(d) (3) and (4))
5. Assistance to Nonprofit Sponsors of Low- and Moderate-
Income Housing
(Sections 106(a) and (b), Housing and Urban Development
Act, 1968)
6. Mortgage and Major Home Improvement Loan Insurance
for Urban Renewal Areas
(Section 220(h) National Housing Act, 1934; as amended
by Section 102(a) (3), Housing Act of 1961)
7. Rent Supplements
(Section 101, Housing and Urban Development Act of 1965)
8. Lower Income Rental Assistance
(Section 8, U.S. Housing Act of 1937)
9. Low-Rent Leased Public Housing
(Section 23, U.S. Housing Act of 1937; as amended by
Section 103(a), Housing and Urban Development Act of 1965)
10. Low-Income Public Housing
(U.S. Housing Act of 1937; as amended, Housing and Community
Development Act of 1974)
11. HUD Public Housing Construction Programs--Turnkey and Bid
12. Department of Defense Housing Program
13. College Housing Program

* Unless otherwise identified, all references are to the
National Housing Act of 1937 as amended.

APPENDIX 6

History and Administrative Framework

Cities first began to create local public housing authorities in the 1930s duly authorized "to engage in the development and operation of low-rent housing." The United States Housing Act of 1937 first created a federally-assisted program to provide housing for low-income families although a few local authorities were set up before its passage. Most of the local authorities, however, were organized after passage of state legislation enabling cities to participate in the federal program.

Most local urban redevelopment agencies were created after passage of the Housing Act of 1949. By 1970, there were over 3,250 local public housing authorities, over 1,200 local public agencies administering urban renewal programs, and more than 600 agencies administering public housing and urban renewal in combination.

The Department of Housing and Urban Development (HUD), was created in 1965 as successor to the Housing and Home Finance Agency. HUD incorporated under its umbrella the Public Housing Administration--a successor to the United States Housing Authority established by the United States Housing Act of 1937--the Urban Renewal Administration, and the Community Facilities Administration. In addition, the Federal Housing Authority was incorporated within the HUD sphere although it retained its separate identity. As of mid-1971, HUD had ten regional offices, 39 area offices and 38 insuring offices.

Every local agency or authority operates under three jurisdictions:

- (1) the Federal Government, which regulates the programs and provides a large portion of their funding through the Department of Housing and Urban Development;
- (2) the State, whose enabling legislation authorizes creation of local public bodies and provides the powers to carry out housing and renewal programs; and
- (3) the local government, which establishes public bodies to conduct housing and renewal operations within its jurisdictions and--in the case of housing--allows tax exemption required by federal law.

A Board of Commissioners, usually consisting of five or more individuals holding no other public office, is appointed to govern these public bodies, form their policies, and promote their programs.

Profile of Public Housing

Public housing activity, whether measured by number of local housing authorities or the number of housing units, is distributed in all geographic regions of the nation in communities of all sizes. In 1971, public housing units numbered 1 million: 28 percent located in communities of less than 25,000 population; 19 percent in communities from 25,000 to 100,000 population; 25 percent in communities 100,000 to 250,000 population; and 28 percent in communities of 500,000 or over.

Only in the largest cities of 500,000 or more are high-rise structures built for family-type occupancy. Even in these large cities, only in a few cases (largely in New York City) have new high-rise buildings been constructed for family occupancy in the last five years. This is partially due to the restriction against construction of high-rise.

At least 80 percent public housing development is single-family structures, two-story row houses, three-story apartment buildings with some elevated type structures for elderly occupancy.

Traditionally, public housing has served a cross-section of those low-income households requiring housing assistance. As late as 1966, 48 percent of all residents in public housing received their income from employment; these families were with incomes too low to afford housing on the private market.

Public Housing Financing

Permanent financing for public housing development is obtained through low-interest, federally guaranteed bonds, issued over a term of approximately 40 years and sold on the private market. The attractiveness of these bonds stems from the fact that they carry the guarantee ("full faith and credit") of the Federal Government. In addition the interest income is exempt from Federal taxes, and if held in the same state as the housing authority, are exempt from state taxes as well. Funds from the sale of these bonds are used to pay off temporary loans and to finance the balance of the total development costs. Development costs are all the costs incurred by the PHA including in site acquisition, development, actual construction) salaries of PHA personnel involved in the project, interest expenses, and the cost of appliances and equipment to be installed at the site.

The annual contributions contract between the PHA and the Federal Government is the agreement through which permanent financing of the development is guaranteed. It serves to insure that the housing authority will maintain the low-rent character of the project and that, if debt service on the bonded indebtedness cannot be fully met by project revenues (largely rental income), then HUD will make up the difference through an annual contribution or subsidy. Figure 2 shows the trend in income and expense of public housing units in management between 1966 and 1972. Income is derived from tenant rent which may not exceed 25 percent of family

income. Public housing tenants have incomes below the 80 percent level of the median income in the area. In general, family incomes are well below the 80 percent mark.

In addition to subsidizing the interest and amortization of expenses of the project, HUD pays an annual operating subsidy to the PHA. The level of this subsidy, or on a per unit basis, varies from year to year, as the funds for this purpose are legislated by the Congress. Operating subsidies are for maintenance, insurance, administration and utilities.

We have attempted to estimate the percentage of the operating subsidy that goes toward the payment of utility costs. This figure has been difficult to estimate and we have been advised by HUD officials that even they have never attempted to arrive at such a number. However, we have been advised that over 50 percent of the money that is provided by HUD for operating subsidies goes to pay utility costs. The following figures reflect the total number of units of public housing in the U.S. and the total dollar subsidies made available, or to be made available.

	<u>Total Number of Units</u>
1976	1,070,000
1977	1,085,000
1978	1,107,000
	<u>Total Subsidy in Dollars</u>
1976	580,000,000
1977	595,000,000
1978	685,000,000

HUD officials are concerned about the rising costs of housing subsidies and have expressed a desire to undertake efforts to reverse this trend.

Figure 1. Comparison of Operating Expenses Between Public Housing and Privately-Owned Apartments 1,2/

- 1/ Categories have been consolidated to present a comparison of typical cost areas.
- 2/ Subtracting taxes and collection expenses from privately-owned apartments makes public and private housing comparable in operating expenses.

Source: 1971 HUD Statistical Yearbook and Apartment Building Income/Expense Analysis, 1972 Edition.

FIGURE 2. INCOME AND EXPENSES OF
PUBLIC HOUSING UNITS IN MANAGEMENT: 1966-72*

* EXCLUDES LEASING PROGRAM.

SOURCE: APPROPRIATIONS HEARINGS FOR THE DEPARTMENT OF HOUSING AND
URBAN DEVELOPMENT AND HUD STATISTICAL YEARBOOKS, 1966-1971.

FIGURE 3. TREND IN FEDERAL OPERATING
SUBSIDY: 1962-74

SOURCE: APPROPRIATIONS HEARINGS OF THE DEPARTMENT OF HOUSING AND URBAN
DEVELOPMENT AND HUD FY 74 BUDGET.

for design and construction, but do not prohibit imposing additional requirements that exceed the MPS, providing that project costs come within the limitations of the prototype costs." The regulations go on to say, "Projects shall not be of elaborate or extravagant design or materials; however, the design and materials for projects shall promote serviceability, efficiency and economy of operation and reflect the standards of the neighborhood and the community in the need for maximizing the conservation of energy for heating, lighting and other purposes."

APPENDIX 7

HUD's Legislative Mandate to Promote Conservation in Public Housing

The Housing and Urban Development Act of 1970 authorizes the Secretary of HUD to undertake programs of research and demonstration relating to the mission and programs of the Department. Section 502(a) of the Act specifically states that: "The Secretary shall require, to the greatest extent feasible, the employment of new and improved technologies, methods and materials in housing construction, rehabilitation and maintenance under programs administered by her with a view to reducing costs and shall encourage and promote the acceptance and application of such advanced technology, methods and materials by all segments of the housing industry, communities, industries engaged in urban development activities, and the general public."

In addition, the Act provides for direct cooperation with other federal departments and agencies. Section 502(f) of the Act states: "In carrying out activities under Section 501, the Secretary shall utilize to the fullest extents feasible the available facilities of other federal departments and agencies, and shall consult with and make recommendations to, such departments and agencies. The Secretary may enter into working agreements with such departments and agencies and can contract or make grants on her behalf and such departments and agencies are hereby authorized to execute such contracts and grants."

All public housing must meet HUD's minimum property standards (MPS) according to the Public Housing Development Handbook, March 1977. "The MPS are required minimum standards