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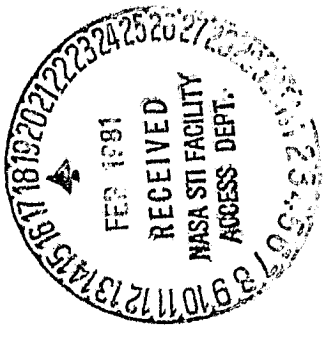
HOUSING AUTHORITY OF BALTIMORE CITY-PUBLIC HOUSING ENERGY WORKSHOP

Thomas S. Golden, Editor
Goddard Space Flight Center
Greenbelt, Maryland

TIDEWATER INN
SEPTEMBER 21-23, 1980



National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland 20771

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ABSTRACT

The upward trend in fuel cost is making itself felt on the quality and in some cases the very existence of adequate low cost public housing. The City of Baltimore has a very fine record on most counts in the quality, services and general tenant satisfaction and participation throughout their public housing. These factors are threatened by increasing energy costs. The budget for water, electricity, gas and oil has increased from $8.8 million in 1978 to $13.8 million in 1980 and it is expected to continue rising.

The NASA/Baltimore Applications Project operating at the Goddard Space Flight Center was called upon by the Housing Authority of Baltimore City (HABC) to consider the situation and suggest methods for correction and alleviation. The first step chosen was to elicit as many different options for solution as possible through means of a Public Housing Energy Workshop held in Easton, Maryland in September 1980. A final role for the Workshop was a listing and qualifying of each alternative as to its suitability and cost. Specific areas were examined by three panels: (1) Systems, (2) Conservation and Motivation, and (3) Fuels. Each panel was made up of persons from differing but appropriate backgrounds; membership was not restricted to "housing people" alone. This report is a summary of their deliberations – it will be used as a stepping stone to further selection and implementation of alternatives.

ACKNOWLEDGEMENTS

Numbers of persons have contributed to the planning and success of the Public Housing Energy Workshop. It is impossible to name them all. Outstanding contributions were made by Mr. Joe Page of the Housing Authority of Baltimore City (HABC) in assisting and advising with the entire affair and by Ms. Susan Clark, secretary and general aide during the course of the workshop.

At Goddard Space Flight Center special note should be made of the early leadership of Dr. Edward Wolff and H. J. Peake, neither of whom were able to participate for physical illness and retirement reasons, respectively. Special thanks are due to Donald Hutchison, for leading the Conservation Panel, to Jim Robinson, leader of the Fuels and, most especially, to Professor William Snyder, Head of the Department of Engineering Science and Mechanics, University of Tennessee, who filled in on twelve hours notice as leader of the Systems Panel. Thanks are also due Ms. Elaine Bobbitt for pulling together the Goddard end of the pre-workshop activities and for the typing and editing of the final report, and to Eugene Sober whose photographs help this report to catch the real sincerity with which the participants approached their task. Lastly, appreciation is expressed to the individual panel members who gave of their time and their honest thoughts on the subjects at hand.

1. Systems Panel at work.
2. Deputy Commissioner, John McCauley, explains workshop objectives.
3. J. Van Story Branch, "Mr. Housing Management" reporting.
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7. Participants enjoying Eastern Shore cuisine.

All Photos by Eugene Sober, Facilities Engineering Division, GSFC

A BRIEF HISTORY OF THE PUBLIC HOUSING PROGRAM IN THE CITY OF BALTIMORE

(From remarks made Sunday P.M., September 21, 1980
by J. Van Story Branch)*

The Public Housing Program came into being through the Housing Act of 1937 and, since its inception, has been the primary mechanism by which the federal government has provided decent, safe and sanitary housing to low-income families, at affordable rents.

In Baltimore, the program is operated by the Housing Authority of Baltimore City (HABC), a public agency chartered in 1937 by the State of Maryland. The HABC is now part of the Baltimore City Department of Housing and Community Development (HCD), and the Department's Commissioner is also Executive Director of the Housing Authority. Operating policy is determined by a five-member Commission named by the Mayor. One public housing resident – presently the Chairman of the Resident Advisory Board – is a member of the Commission.

Construction of the buildings is financed through bonds sold by the HABC. The federal government, through the Department of Housing and Urban Development (HUD), guarantees the bonds and makes an annual contribution sufficient to pay off the bonds.

In theory, operation and maintenance of the units is financed by rents. However, in 1969, the federal government reduced rental income substantially by limiting rents to no more than 25 percent of a family's income; subsequent legislation did not change this policy – it continues in effect today. HUD provides a subsidy to make up the difference between spiraling operating costs and reduced rental income.

No State or City money is spent to build or operate the HABC public housing program, but the City does exempt low-income housing units from property taxes – a requirement for federal public housing funds. The HABC provides the City an annual payment in lieu of taxes to defray the cost of City services given to its residents.

The first public housing development in Baltimore, Edgar Allan Poe Homes, was opened in October, 1940. This is a low-rise, family development, consisting of 298 dwelling units. Since then, the HABC has added 14,670 additional regular public housing units to its inventory, bringing the total to 14,968 units located in 42 developments throughout the City. Of these, 11,359 are designed for family occupancy, and 3,609 for occupancy by the elderly, disabled and handicapped. Walk-ups and townhouses comprise 9,248 dwelling units; the remaining 5,720 are in high-rise buildings, which also include the units designed for occupancy by the elderly, disabled and handicapped.

In addition to its regular public housing program, the HABC operates what is known as the Rehabilitated Housing Program. These rehabilitated homes are located in neighborhoods, in all parts of the City, and have become the most sought-after form of public housing in the HABC operation. At present, there are 1,783 units in this program, and another 70 being rehabilitated.

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*Director of the Division of Housing Management, Housing Authority of Baltimore City.

The HABC housing program provides a home for some 50,000 low-income persons. Of these, about 50 percent are under 21 years of age and 11 percent are aged 62 years and over.

Average Annual Net Income (the amount on which rent is based) is under $3,500; average monthly rent is approximately $70, which includes utilities.

Many people consider Baltimore's public housing program as one of the best operated in the country. It is certainly popular with local residents, who continue to apply in large numbers. At the present time, there are almost 35,000 families waiting to be housed in the program. This reflects not only the overwhelming need for assisted housing in Baltimore, but also that public housing provides a far better home, at an affordable rent, than is generally available in the private housing market. In the HABC operation, the dwellings are built well, from the standpoint of both livability and endurance; each unit, and each development, receives constant maintenance as needed to keep it decent, safe and sanitary; an extensive social services program is carried out to assure that public housing is providing more than just shelter; residents and management work together, in recognition of the mutual benefits that can come from cooperation toward continued improvement of the program.

The responsibility of the Housing Authority to public housing residents does not stop with providing a place to live. The agency has, from its start, been committed to providing "Shelter plus," recognizing that families need services, not just a place in which to live and bring up their children.

At many of the developments, services such as day care centers, Eating Together programs, senior aides, well baby clinics, food-buying clubs, neighborhood centers, Boy Scout and Girl Scout activities, and Youth Advisory Councils are taking place.

Recreational activities are conducted at all developments, and are geared to all ages. There are men's clubs, women's clubs, arts and crafts, dancing, exercise classes, bingo and athletics. Four developments have swimming pools.

Family counseling is provided relating to personal and family functioning, child rearing and behavior, adolescent behavior problems, education, household management, housing improvements, health, and activiites to facilitate participation in community life. Child development programs offer information, instruction and support in growth and development for the baby and an opportunity for the mother to develop new skills in child-rearing and development.

In a number of developments, health clinics, congregate meals, housekeeping services, and personal services are available to elderly residents who can no longer function independently but who do not want the care of a nursing home.

There is a tenant council at each of the developments, and an elected Resident Advisory Board representing each development participates in many decisions affecting the public housing program.

The growth of the Baltimore public housing program and the changes in the lifestyles of the tenantry have brought difficulties that were not experienced in earlier years. Our families expect -- and rightfully so -- to be able to enjoy the amenities that belong in today's society and times. These amenities include such items as air conditioners, modern refrigerators and ranges, washing machines and dryers. Our families expect to be comfortably warm in the winter, and cool in the summer.

This has dramatically increased the consumption of utilities, the cost of which the HABC must meet from an already burdened budget. Of necessity, needed maintenance items must be delayed in order to meet the spiraling costs of energy-related items – water, electricity, gas and heating fuel.

It is evident that the HABC must make its residents "energy conscious," and so we have come to meet with you for any ideas which you care to share.

OPENING REMARKS BY COMMISSIONER M. J. BRODIE, HOUSING AUTHORITY OF BALTIMORE CITY*

First, on behalf of the Housing Authority of Baltimore City let me welcome your participation in this energy workshop. We are particularly indebted to Tom Golden and Dr. Edward Wolff and their colleagues from NASA's Goddard Space Flight Center for recommending the idea and for agreeing to coordinate this new (for us) approach to examining a complex public housing problem. During the course of the workshop we will be making a concerted effort to better understand the nature of the problem and to find alternate solutions, short range solutions as well as those that could be incorporated in our planning for the longer range.

The problem in its simplest terms is one of rapidly escalating energy costs in a budgetary situation where the dollars to pay these costs are severely limited by federal housing and budget policy.

The Housing Authority of Baltimore City provides a home for approximately 17,000 low-income families, including providing directly for most of their energy costs.

For the fiscal year ending on June 30, 1978 we budgeted $8.8 million for all utilities—water, electricity, gas and fuel—a per unit month cost of $55. For the fiscal year ending June 30, 1980 we budgeted $13.8 million at a per unit month cost of $75. While costs for electricity and gas increased 12.5 percent and 16.5 percent, respectively, for fiscal year 1980 over 1979, the cost for fuel oil increased a staggering 71.4 percent over the same one year period, in terms of dollars an additional $25 million. Under this kind of cost pressure the prospect for our being able to continue to develop and manage critically needed low income housing opportunities is increasingly thrown into question.

Neither the Housing Authority nor HUD have been idle in the face of the rapidly changing energy situation. However, the response to date has been pretty much limited to the targeting of some development dollars for the purpose of making the existing physical plant more energy efficient, via retrofitting, weatherizing buildings, upgrading heating systems and converting from oil to gas. At the local level there has been a concerted effort to measure energy loss in buildings, to reduce energy use via temperature controls and to exhort tenants to voluntarily conserve energy through information and education campaigns.

By federal law, the rent paid by a public housing tenant cannot exceed 25 percent of the tenant's adjusted gross income. Further, this rent must include a fair allowance for utility usage. We do surcharge for excess usage of electricity where check metering is either permitted or feasible. However, we cannot look to the tenants at this time to pay an increased rent, although there has been some discussion of this in the Congress. Whether tenants *should* be asked to pay an increased rent is a good question to ask in light of the fact that the average net income for families in Baltimore City's public housing is under $3,500. Our average rent is approximately $70 per month.

Under the present subsidy formula for utility costs, the Housing Authority is assured payment of the amount budgeted for utilities and approved by HUD in advance *if*, a very important *if*, HUD has the

*Delivered Monday A.M., September 22, 1980, by Mr. John McCauley, Deputy Commissioner of HABC.

funds available to meet this cost. HUD will pay 75 percent of the cost of a budget overrun attributable to a rate increase; it will not pay any budget excess attributable to consumption increase. The Housing Authority is permitted to retain 25 percent of any utility cost savings earned through decreased consumption in the budget year. The amount budgeted each year for utilities is based on a three year average.

Housing Authority staff have put a good deal of effort into providing each work group with the technical detail describing the full range of the utility systems presently in place as well as consumption data and the kinds of housing under our management. Knowledgeable Housing Authority staff, of course, will also be in each work group and should be able to quickly obtain any informational needs we did not think of in advance.

What we look to derive from the workshop is the product of the creative thinking of informed people, brainstorming if you will, on the alternatives available to a large local housing authority for meeting the present and future energy needs of its tenant body in ways that are consistent with the funds and technology projected to be reasonably available. While the focus of the workshop is the Housing Authority of Baltimore City it is likely that the findings and recommendations would be useful wherever meeting the energy costs for low-income households is found to be a serious problem. We would be expecting each group to be working toward a written summary of its ideas and conclusions. Responsibility for editing and possible publication of the final paper will be assumed by the NASA team.

I think we have an excellent cross section of representation on each of the work groups and look forward to a very successful workshop. Thank you again for sharing your time with us.

GOOD LUCK!

INTRODUCTION

The Workshop operated in three discrete areas: Systems, Conservation and Motivation, and Fuels. The following paragraphs provide functional statements for the work to be done by each Group or Panel.

The Systems Panel (Group I) will work from a standpoint of combining or collecting together the sources of heating (i.e., as in a district heating system). They will enumerate and discuss systems which might be used to augment other systems such as solar, modular integrated utility systems (MIUS) concepts, solar electric generation, multiple fuel boilers (i.e., coal, refuse, natural gas and or oil). A list will be developed in which the factors which are important for each system such as capital cost, state-of-the-art, optimum scale size, fuel availability (now and future), potential impact on users and the environment and acceptability from an economic perspective. As a future concept, use of a geodesic dome for a multiple housing area might also be included in Group I processes. The idea is to generate a matrix of systems versus characteristics of importance to the decision making process.

The Conservation and Motivation Panel (Group II) will concern itself first with modifications that might be possible or feasible to existing public housing so that less energy for heating will be required. They will explore areas for possible new architectural strategies for future construction. Another important area of concern is that of personal motivation of tenants to be more conservative, more conservation minded, or more tolerant of reduced temperatures in their living spaces. Factors such as individual metering or a personal reward system for energy saving could be a part of Group II agenda.

The Fuels Panel (Group III) should address its discussion to the determination of fuel alternatives. Solar steam, solar electric and solar hot water, coal in all its forms (liquified, powdered, lignite), refuse and refuse derived fuel and any combinations of the above should be discussed. In addition, consideration should be given to the residue (e.g., ashes) from the combustion of each fuel and to the environmental hazards and the cost of reducing risk. In each case there will be impact on the neighborhood surrounding a facility and the individuals who reside or work there. It is important to discuss and enumerate this aspect of each fuel choice in Group III.

Each group should prepare a legible "pencil draft" of its findings before the sessions are completed on Tuesday. Each group should name a rapporteur or scribe early in (or even before) the sessions to accommodate this function. The NASA participants will take the pencil drafts and edit, add to and publish them. This would of course occur after the review and approval of the manuscript by the Housing Authority. The publication would serve as a working paper and a record of the Workshop. Each participant will be provided with his own copy. Additional copies will be made available to the Department of Housing and Community Development for their future use.

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PANEL I – SYSTEMS PANEL

Mr. Glenn Graham, Rapporteur

The objectives of the systems panel were (1) to explore alternative systems for meeting the HABC and domestic hot water requirements at the lowest possible cost in public housing under the jurisdiction of the Housing Authority of the City of Baltimore, and (2) to define and rank the parameters affecting each alternative.

Our interpretation of systems was limited to primary energy systems which furnish energy across the building envelope. Secondary distribution methods were not considered because it was felt that these systems encompassed detailed engineering design.

A brief description of some major alternatives and supplementary considerations are outlined below as suggestions for more thorough investigation by HABC.

ALTERNATIVES

District Heating (Remote Central Heating)

The option of expanding and/or modifying systems for heating several facilities from a central location in addition to existing capability. Where density and proximity of source and user make such an approach practical.

Co-Generation (Both Approaches)

a. Primary thermal output with supplementary electrical generation.

b. Electrical output with low end use of residual thermal output. Can be considered to supplement District Heating above.

This systems approach is already in application in New York and California. Their efforts should supply valuable data and basic operational information within the next year. Institutional barriers and other non-technical obstacles are being removed by their efforts.

This appears to be a very important alternative for the intermediate term and should be investigated in some depth by HABC.

Solar Hot Water

The application of solar hot water heating as a primary and supplementary source of hot water in warm months is a promising concept for some HABC locations where an inefficient application of a large boiler for moderate to small quantities of domestic hot water is presently employed.

Solar Space Heating

Solar space heating may be considered for evaluation in intermediate to long term applications.

Chemical Systems

Chemical systems may be considered for a long term approach.

Individual Home Units

The individual home heating unit is defined as an individual housing unit where there are individual space and hot water heating, along with on site metering of consumption. There are approximately 1700 of these units scattered throughout Baltimore City. These structures are owned and maintained by the Housing Authority. While fuel consumption is controlled by the tenant, maintenance is performed by HABC employees. Although individual unit consumption of fuel is small, there are few economies of scale in this type of housing, and minimal control of energy consumption by the Housing Authority.

Single Building Central Heating

Single building central heating systems include multi-family unit buildings where space heating and hot water is provided by systems contained within the building. This includes individual high rise buildings, and complexes of row houses supported by one centrally located system. These buildings are currently operated by oil, natural gas, steam, hot water systems, and range in size from a few units to 200 units. The buildings vary widely in age, equipment, efficiency of operation, fuels used, metering, and control. In some cases there is individual unit control of thermostats, while in others, everything is controlled and locked.

SUPPLEMENTARY CONCEPTS

Multifuel Combustors

The use of multifuel boilers and furnaces (including fluidized bed coal burners) should receive serious consideration where replacement or expansion of present equipment is contemplated.

Refuse Combustion (On Site)

Another possible economy may be obtainable by burning refuse on site in the larger high rise complexes or high density group facilities. The trade off of this option should be carefully weighed against the cost of equipment and logistics for handling present refuse. Baltimore City has been involved in refuse combustion projects to use for a source of data for this evaluation.

PARAMETERS

The Panel felt that of all the parameters discussed, three deserved special mention. These parameters are: (a) controls, (b) submetering, and (c) cost considerations, and they were felt by the panel to be particularly significant to everyone of the identified alternative systems.

Controls

The installation of proper control devices and subsystems is imperative in the efficient utilization of any energy consumption system. Many problems exist in public housing control systems in both

the equipment types and locations, as well as in the mode or factors governing the control sequences. In considering the incorporation of new or replacement control systems certain guidelines must be established so as to effectively control the operation of the energy consuming equipment while avoiding certain problems which are inherent in this specific environment (public housing).

The guidelines that must be considered to achieve a satisfactory control system include the following:

a. Tenant Accessibility--It is desirable to select the control equipment that offers the least opportunity for tenant tampering. Remote sensing devices and other methods of eliminating tenant responsibility for adjustment are desired.

b. Zoning--The evaluation of existing zones and reselection with particular emphasis on the reduction of size and grouping of zones with similar load characteristics is imperative to provide more uniform distribution.

c. Simplicity--Control sytsems and components should be as simple as possible while still having the capability of effectively achieving the desired results. This approach should also effectively reduce maintenance costs in that equipment could be serviced by "in-house" personnel.

d. Flexibility--The components should be capable of adjustment to meet the changing demands within the building or distribution system.

e. Centralized Control--At the Central Avenue heating plant, currently supplying steam for hot water and space heating to five housing projects, a central control console could be installed at the plant to give the plant personnel positive control over all the heating zones. During periods of mild weather the zones could be manually shutdown. Also, the control system could be designed to give remote temperature readings as well as zone value position from the projects to the plant. This type of control would allow plant personnel to diagnose the problems within the system.

   Although the plant personnel have control over the heating zones at Cherry Hill Homes and Latrobe Homes, a remote reading device could be installed, at these plants, to help in an equal distribution of heat.

Submetering

In order to motivate tenants to conserve energy, natural gas, oil, electricity and water, it is recommended that there be a means set up to make the tenants pay for the energy he uses over what shall be considered as a reasonable amount. The lease between the tenant and the HABC provides for the tenant to be allowed a reasonable amount of a utility. The amount should be dependent on the size of the housing unit and the type of equipment furnished as part of the units' facilities.

It is suggested that where there are now master meters, that submetering of the various utilities be provided where practicable. It is desirable to log and monitor usage as is now the case with electricity in administering the billing system for the other utilities.

In addition to motivating the tenant to conserve, the logged information would serve as management information through which highlighting high users would possibly provide a source of income and indicate areas of maintenance problems.

In the situation where there is direct metering by the utility company and City for gas and electricity and water, an allowance could be made to the tenant (rent deduction) by the HABC to cover the utilities. In this case the utility would directly bill the tenant who would be responsible for its payment. If the tenant conserves, he benefits; if he wastes, he would pay.

The psychological effect of a metered approach should produce positive benefits and this metered approach would meet the federal guidelines and requirements for conservation.

Cost Considerations

Although initial cost alone can be a major consideration, it should not be the only factor. One should consider the total costs involved in a project, including but not limited to, operating costs, maintenance charges, and potential salvage value of the equipment.

The use of the life cycle costing method to determine the Net Present Value (NPV) or Internal Rate of Return (IRR) for a particular project should always be a major consideration in the determination of the appropriate alternative.

In general, the life cycle costing procedure will give the lowest energy cost, but specific energy analysis should always be conducted.

CONCLUSIONS

1. It is the understanding of the panel that the Housing Authority of Baltimore City (HABC) does not anticipate significant expansion of new facilities in the near future.

2. Because of conclusion 1, the aternatives identified were limited to those applicable to existing housing units.

3. Particular areas of exploration by HABC should focus on:

   a. Increasing the number of trained and qualified operating and maintenance technicians.

   b. Upgrading and improving controls on existing systems.

   c. Installing submetering for each tenant space to motivate the tenants to practice energy conservation and to permit HABC to identify areas of excessive consumption.

   d. Improving the load matching capability of the energy consuming systems.

   e. Implementing life cycle cost procedures when equipment replacement is necessary.

4. The identified alternatives and parameters are shown in Matrix 1 on the following page.

MATRIX 1

Parameters \ Alternatives	Individual Home Units	Single Location Central Heating	Remote Location Central Heating	Co-generation Unit	Chemical (Fuel Cells)	Solar Hot Water	Solar Space Heating
First Cost	●	●	●	●	●	●	●
Maintenance	o	●	●	●	●	●	●
Control	●	●	●	●	●	●	●
User Education	o						
Fuel Flexibility & Substitution		●	●	●			
Environment		o	●	●			
Fuel Availability	o	o	●	●		o	o
Reliability	●	●	●	●	●	●	●
Political/ Regulatory Questions		o	o	●			
Submetering	●	●	●	●	●	●	●
Efficiency	●	●	●	●	●	●	●
Life Cycle Cost	o	●	●	●	●	●	●
Load Matching	●	●	●	●			
Commercial Availability				o	●	●	●

●–Very Important o–Slightly Important Unimportant Leave Blank

MEMBERSHIP OF PANEL II – CONSERVATION & MOTIVATION

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PANEL II – CONSERVATION & MOTIVATION PANEL

Dr. Nancy Booth, Rapporteur

The panel attempted to identify viable alternatives for achieving energy conservation in public housing. The problems associated with reducing energy consumption in public housing are complicated by the fact that present housing units are inherited from a period when energy consumption cost less than energy conservation or long-term efficiency. Efforts to improve the energy performance characteristics of building stock through well developed and thought-out energy standards and codes initially will be limited to new buildings, while the larger problem inherent in attacking energy waste and inefficiencies in older buildings must be approached somewhat differently. It would appear that conservation would provide a partial answer at least. Two principal avenues are available for attaining energy conservation objectives:

a. Convert existing public housing into more energy-efficient units through the retrofit application of energy-conserving technologies and techniques; and

b. Modify individual tenant behavior and attitude through incentives, education, and other appropriate means.

BUILDING ENERGY EFFICIENCY

Improved energy efficiency of buildings is usually accomplished through retrofit activities which add insulation, weatherstripping, thermostat timers, and other building and system improvements. The effective improvement of existing facilities requires an evaluation of the energy budget or characteristics of housing units on a unit-by-unit basis, the development of an inventory listing of effective conservation actions and the implementation of viable energy conservation measures. These techniques and processes are generally well known and were, therefore, not discussed at length by the Conservation Working Panel. Further, recent modification to Federal Regulations (see Conservation Appendix) prescribes mandatory energy audits of public housing units over the next three years.

TENANT BEHAVIOR ATTITUDES

Energy use in buildings is only partly a function of the physical characteristics of the buildings; it also depends on the behavior (and habits) of those who use the building. It is assumed that a large amount of public housing energy consumption reflects the individual decisions of thousands of tenants. Policies and actions designed to achieve energy savings in public housing must attempt to alter poor energy-consuming practices and behavior of individuals.

Unfortunately, motivation to conserve energy among public housing residents is limited. Studies have shown that low income families are no different than moderate, middle, or high income groups. All are motivated to conserve energy if some direct benefit (i.e., save money) can be realized. Since in public housing there appears to be no monetary incentives, most perceive energy conservation as a threat that the "system" is going to take away something and thus reduce their supply of heat or light below comfortable or conventional standards. Also, there is a high level of cynicism concerning the "energy crisis." Record oil company profits, relatively stable gas and oil prices, and an apparent "business-as-usual" approach at work and in other areas tend to make it reasonable to

believe that energy conservation is nothing more than a forced energy reduction, or another method of taking something from the poor. Consequently, a number (perhaps many) of the public housing tenants have an "I don't care" or "let someone else do it" attitude. Some also feel it's included in their rent and they should not be held responsible—or accountable—for energy consumption.

Such attitudinal/behavior patterns are extremely difficult to penetrate and change. For the most part they are built upon strongly believed perceptions and a general distrust of the so called establishment.

CONCLUSIONS

The panel used "brainstorming" techniques to develop a matrix identifying various alternative methods for achieving conservation. In addition to alternatives, parameters were examined that needed to be considered to determine the practicality of each alternative. Matrix 2 which follows summarizes results of the Conservation & Motivation Panel.

MATRIX 2

Parameter \ Alternative	Building Audits	Unit Audits	Tenant Incentives/Motivation	Tenant Education	Optimize System Performance	Code Changes and Establishment	Management/Staff/ Maintenance Training	Tenant Conservation Ideas
Staff Augmentation	●	●	●	●	o		o	
New Funding	●	●	o	●	o		o	
Reallocation of Funding			o	o	o		o	
Training	●	●		●	●		●	
Program Development	●	●	●	●	●		●	●
Regulatory Impact			o		o	●		
Data and Analysis	o	o	●	o	●	●	o	
Political Acceptability			o			o		o
Management Support	●	●	●	●	●	●		●
Publicity/Public Relations	o	o	●	●	o	o		●
Tenant Acceptance	o	●	●	●	o			●
Tenant Participation			●	●				●
Interagency Cooperation			o	o		o	o	
Allocation of Funds, Manpower, & Materials	●	●	o	o	●		o	
Installation of Check Meters	o	o	●	o				
Regulatory Requirement	●	●			●			
Capital Improvements	o	o			o	o		
State-of-the-Art					●		o	
Legislative Support						●		
Enforceability	o	o				●		
State Support						●	o	o
Federal Support	●	●	o			●	o	o

● – Very Important o – Slightly Important or Should Be Considered Blank – Unimportant

After reviewing the eight alternatives for conserving energy in public housing projects and considering the myriad of parameters which would influence the successful implementation of these alternatives, a summary evaluation was conducted by the study group. (Because of the similarities between the alternatives for Tenant Education and Tenant Conservation Ideas, they were combined as one alternative for evaluation purposes.) The evaluation sought to rank the seven alternatives in two ways: (1) in order of highest energy savings potential, and (2) in terms of the feasibility or ease of actually carrying the project to fruition. The rankings which follow are a composite of individual group member ratings and reflect the relative importance of the parameters which apply to each of the alternaitves.

Energy Savings Potential Ranking

Alternative	Composite Score	Rank
Optimize System Performance	25	1
Building Audits	27	2
Tenant Incentives/Motivation	34	3
Tenant Education/Ideas	50	4
Management/Maintenance Staff Training	50	5
Code Changes and Establishment	59	6
Unit Audits	60	7

As can be seen, it is the feeling of the group that optimizing system performance would result in the greatest energy savings, followed closely by building audits and tenant incentive programs. After a large scoring jump the other four alternatives are fairly closely ranked.

Ease of Implementation Ranking

Alternative	Composite Score	Rank
Management/Maintenance Staff Training	26	1
Optimize System Performance	36	2
Building Audits	37	3
Tenant Education/Ideas	40	4
Tenant Incentives/Motivation	41	5
Unit Audits	63	6
Code Changes and Establishment	64	7

It was felt that management and maintenance staff training would be the easiest to accomplish. The next four alternatives were scored rather closely behind followed, after a rather large scoring jump, by unit audits and code changes and establishment. It is important to note that different parameters affect the ease with which alternatives can be implemented and the evaluation of alternatives should involve a review of these factors to decide which can be worked out. For

example, some alternatives may be costly and require significant federal or other funding while others require staff, active tenant acceptance or participation, etc.

As a sweeping generalization, the three alternatives having the greatest potential appear to be optimization of system performance, completion of building audits and the associated implementation of the energy conservation measures identified, and providing tenant incentives. The panel hopes this information proves useful to the Housing Authority decision-makers and planners, and that it will serve as a positive influence in the achievement of energy conservation.

Note: It is our understanding that the Housing Authority has taken steps toward the contractual conduct of required audits as they related to central heating and cooling equipment and their distribution systems, but have *not* included building audits in immediate plans or schedules. It is strongly urged that steps be taken to expedite the performance of the building audits.

DEFINITION OF ALTERNATIVES

Building Audits

Building audits are required by Federal Regulation (see Conservation Appendix) and are assumed to include the physical audit process, the cost benefit and payback prioritization of each energy conservation measure identified by the audit and recommendations on energy conservation measures. A building audit includes the total building shell or envelope and all areas therein.

Unit Audits

The definition of Unit Audits is the same as for Building Audits but encompasses individual resident abodes as compared to the building envelope.

Tenant Incentive Motivation

This alternative entails the creation and implementation of special programs designed to stimulate tenant cooperation and participation in the conservation program, e.g.:

1. Tenant Incentive Motivation -Project Wide. Because many projects are not equipped with individual metering, it was felt a project-wide competition may help. Several ideas were discussed here which may have application. They include:

    a. Setting up a lottery. This idea could have great success because of the limited income persons' "love" of lotteries. Basically, if a project was able to reduce energy consumption by a predetermined amount, a proportion of savings would be given away in a lottery. One representative from each household would have a chance at winning the prize money.

    b. Clean Block Concept. The Afro clean block campaign was very successful in Baltimore. By adopting something like it to energy conservation, we might be able to gain support. In general, such an effort would need to contain the following:

(1) Massive publicity campaign including TV, radio, schools and news

(2) Public support from Mayor and City Council

(3) Some type of individual emblem or sticker to put on doors

(4) Project award system

c. Reallocation of Resources. If monies were available from other agencies for upgrading, the projects which conserved the most energy would get first consideration. This may mean a new playground or a new security system. To pull this off, interagency coordination is critical.

2. Development of Rental/Utility Payment Options. Tenants could choose between the existing payment system or a payment system which would reward successful conservation efforts.

3. Surcharge Plan. A surcharge plan applicable to all tenants whereby excessive energy consumption would be charged to the tenant.

4. Discretionary Resources. Discretionary Resources could be used to reward tenants in energy saving buildings.

5. Tenant Incentive Motivation-Individual Unit. The alternatives discussed in items 2, 3, and 4 above, outline the incentives which could work in the individually metered units. Much of our discussion centered on the legal ramifications of imposing a new system on old tenants. Because of this concern, it was decided to explore the possibility of working with new tenants. Each tenant would be charged for utilities above on a pre-established level. However, they also would be given a rebate if they consumed less than the amount allocated to them. It was felt this same plan could be made available to existing tenants.

To accomplish this plan, the Housing Authority would have to commit itself to equipping each vacant unit with individual metering. Since the average length of residency is four years, this could be completed in a relatively short period.

Tenant Education

Tenant education involves the development and implementation of a special education program for a small cadre of volunteer tenant leaders who could be instrumental in assisting and educating tenants in energy conservation. Also, it is suggested that new tenants be "required" to attend some basic classes on energy conservation. This would be explained to them before they signed the lease. These classes could either be small group sessions or one-on-one assistance. The latter, taught by a neighbor, would be most effective with limited income people. These volunteer energy advocates would need to have special training and some form of recognition. A stipend or a small fee for every class would be ideal. It shouldn't be too hard to find some grant money to pay these stipends.

Optimize System Performance

The optimization of system performance considers the general and preventive maintenance requirements for ensuring that HVAC systems are operating at peak performance. Also included would

be consideration of other operating factors to enhance conservation (such as the intermittent cycling of cooling and heating equipment which would be appropriate for maintaining comfort conditions while minimizing energy consumption).

Code Changes and Establishment

As an alternative for energy conservation, an examination of existing codes is required to determine whether such codes should be more stringent or more relaxed and to establish codes where no codes exist.

Management/Staff/Maintenance Training

One objective of this alternative is to provide training for building managers and maintenance personnel. This would include both technical and "sensitivity" training. This alternative includes basic energy conservation training to enhance the staff's work efforts as well as special sensitivity training to raise tenant acceptance and understanding of the conservation program.

Tenant Conservation Ideas

Tenants are likely to provide valuable ideas for enhancing conservation success within the public housing community. A mechanism is needed to stimulate the active and knowledgeable participation of tenants in the conservation program. A suggestion box was discussed with rewards given to any ideas that saved a certain amount of money. This idea may not yield any earth-shattering results, but it is easy to implement and should help out with public awareness.

DEFINITION OF PARAMETERS

Staff Augmentation

To employ those personnel who are qualified and motivated to develop and implement a viable and effective energy conservation program which will achieve a reduction in the consumption of all utilities among the resident population and motivate management personnel to actively pursue this goal.

In this context, there would be a need for additional positions. For the purpose of this workshop, it was assumed that staff augmentation would include an increase in ceiling allocation plus associated funding.

New Funding

To obtain funds through HUD and other agencies such as U.S. Dept. of Energy, State Dept. of Energy, City Dept. of Energy, Dept. of Natural Resources and others that would become known to the Authority from time to time. This includes the seeking of grants in the private and public sector.

Reallocation of Funding

The redistribution of funds within the HABC budget.

Training

Develop and implement a continuing and comprehensive training program for the Authority's management and maintenance staff and selected residents in each development who would be capable of implementing energy conservation measures or sharing the knowledge gained to other residents for the purpose of reducing energy consumption in all public housing developments. The aid of local colleges and other resources in the community will be solicited to assist in training which will be required.

Program Development

The careful and comprehensive preparation of individual program guidelines is essential. Analysis and thorough coordination are required to see that the objectives of each program sub-set are precisely defined, that instruction materials are documented in sufficient detail and that review and evaluation milestones are established. This is to assure that instructions are followed or that mid-course corrections are made if necessary. Interim and final reporting is essential to make sure that the objectives are obtained.

Regulatory Impact

Local codes, regulations and policies can adversely impact energy conservation measures. For example, the requirements to maintain certain temperature levels may be obsolete when applied to current energy considerations. The optimum operation of building systems as to air volume and air changes may mean that city codes must be amended. Formal fiscal procurement policies might need revision if new innovative concepts are applied to expenditures for tenant incentive efforts.

Data and Analysis

Data and its analysis are of prime importance in energy conservation and tenant motivation. The amounts of data may be large and diverse. Such items as history of use, building insulation values as a function of time, changes in equipment, appliances etc. should be examined for their importance in analysis and reduction of the amount of information needed to take administrative action. Actions include expenditures both incrementally small but perhaps numerous as well as large and singular. System improvements made will be based on cost analysis, tenant rewards or surcharges on energy consumed.

Political Acceptability

Political acceptability designates non difficulty with elected officials and community leaders in the implementation of administrative decisions and actions; e.g., problems may arise in the mechanics of a Tenant Incentive Program. New ways of dealing with tenants in order to cope with escalating energy costs must be politically acceptable. Prevailing political climates must be considered in the formulation of new requirements and systems.

Management Support

Actions intended to conserve energy in public housing projects must be approved and supported by the Mayor and other appropriate city officials. Support carries the necesssary authority to

manage a project, seek requisite funding, negotiate with appropriate agencies and officials and organize and assign staff in a manner which will facilitate the successful competition of the energy project.

Publicity and Public Relations

This refers to dissemination of all newsworthy information by the media such as the local press and radio. This would primarily pertain to the favorable programs of the Housing Authority that employ energy conservation measures throughout the various projects. Public Relations (PR) also pertains to the promotion of goodwill and cooperation through meetings and other PR functions with the various resident groups. It also concerns the efforts of the management staff to relate the benefits the tenants could derive from their energy conservation efforts.

Tenant Acceptability

The approval by residents of assisted housing of proposed energy initiatives. In preparing programs, full consideration must be given to tenant perceptions with procedures devised and to accommodate their views as much as possible.

Tenant Participation

In a number of instances tenant participation is critical to the successful accomplishment of an alternative. In some cases participation may not be essential but should be considered. This is an area that program initiators must be sensitive toward and it should not be overlooked.

Interagency Cooperation

Interagency cooperation is the process of various agencies with expertise or resources affecting the implementation of chosen energy saving alternatives working in a joint, coordinated, cooperative manner.

Allocation of Funding, Manpower and Materials

This relates to the implementation of improvements to the buildings and various utility systems to effect energy conservation. It would involve expenditures for labor and material, such as that required for making the existing physical plant more energy efficient via retrofitting, weatherizing buildings and the conversion from oil to gas.

Installation of Check Meters

A check meter is a device for measuring utility consumption (gas, electric and water) of each individual dwelling unit where the utility service is supplied through a Master Meter System. The check meter consumption readings may be used to determine whether and to what extent the utility consumption of each dwelling unit is in excess of the allowances for PHA-furnished utilities.

Regulatory Requirements

These are inactments by the governmental legislatures as they pertain to operations of the Housing Authority. This includes such parameters as temperature setting for space heating and hot water.

Capital Improvements

Capital improvements are physical changes in the structures or equipment which result in the increase worth of the facility. Many capital improvements are high-dollar, long lead time items. These should be prioritized so as to obtain the maximum benefit of pay-back and promptly made a part of the capital improvement program.

State-of-the-Art

State-of-the-art refers to the accessability of technological improvements that may be brought to bear upon the problem, e.g., flow meter technology, furnace improvements, thermostats controls, boiler and chiller applications, temperature sensing devices. Most energy conservation measures are well within the state-of-the-art; however, new technologies or devices must be received and integrated where practicable.

Legislative Support

Those areas where new or revised legislative and/or gubernatorial initiatives and/or mandates are required before successful implementation of the program occurs, e.g., passage and implementation of various thermal codes, health and safety codes, air conditioning standards, etc. Attention must be given to the lengthy lead times involved in preparing and introducing new or revised legislation.

Enforceability

Enforceability is the ability to bring to fruition the legislative or regulatory mandates, e.g., codes, monitoring, etc. Attention must also be given to measures that require voluntary tenant participation. Unless there is adequate tenant acceptance, success is unlikely.

State Support

This refers to those funds and technical support that emanate from state programs, e.g., Dept. of Economic and Community Development, Dept. of Natural Resources (Maryland Energy Office), and the University of Maryland.

Federal Support

This refers to those funds and technical support that emanate from federal programs, e.g., Department of Energy, Housing & Urban Devleopment, Environmental Protection Agency, and Health and Human Services.

CONSERVATION APPENDIX

Effective May 7, 1980, the Federal Regulations relating to Public Housing Agencies - Owned Projects - Project Management (24 CFR, Part 865) was modified by the addition of a new Subpart C--Energy Audits and Energy Conservation Measures -- (See Federal Register dated May 7, 1980, 30346 through 30348) which *requires* all Public Housing Agencies to conduct energy audits and undertake appropriate cost-effective energy conservation measures. Energy audits are to be completed by May 1983 and will consider conservation measures such as:

a. Installation of individual utility meters
b. Ceiling Insulation
c. Insulation of bare hot water or steam pipes
d. Caulking and sealing in building joints
e. Weatherstripping for doors and windows
f. Clock thermostats for units with individual heating controls
g. Exterior insulation for hot water heaters located in unheated spaces
h. Insulation for air ducts in unheated spaces
i. Storm doors and windows
j. Replacement of single glazed windows with double glazed windows
k. Replacement of incandescent fixtures in public spaces with higher efficiency lighting
l. Flow restrictors for hot water lines to shower heads and faucets
m. Thermostatic radiator valves
n. Floor insulation over unheated crawl spaces
o. Exterior wall insulation
p. Improved burners for oil-fired heating equipment
q. Improved boiler controls for central, group or building heating plants
r. Separate boilers for domestic hot water in central, group or building heating plants
s. Heat pumps to replace existing electric resistance heating systems.
t. Capacitors, peak load controllers, time clock controls and other equipment that will lower the cost of electricity
u. Any other appropriate cost effective conservation measures, and
v. Solar Energy systems

Energy conservation measures (ECM's) are to be accomplished in the order of "payback" periods, those with the shortest pay-back periods funded first (sequence adjustments are possible under certain circumstances). The cost of accomplishing ECM's, including the cost of audit, are to be covered by Housing Authority Operating funds where feasible. If operating funds are not available,

such costs are eligible for inclusion in a Modernization Program, or funding may be used from any available funds that the Department of Housing and Urban Development may designate to be used for energy conservation.

MEMBERSHIP OF PANEL III – FUELS

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PANEL III – FUELS PANEL

Mr. Ralph Adams, Rapporteur

Although most of the elements in the cost of heating water or making steam are rising, none is increasing as rapidly as the cost of fuel. While the cost of other elements (labor, capital, materials, etc.) are going up, it is the drastic increase in the cost of energy that has caused the greatest budgetary disruption. It is apparent that dependence on the most expensive energy forms such as oil and natural gas must be reduced or eliminated entirely. To accomplish this will require modification of all or parts of the HABC heating systems to use less expensive or more readily available fuel or fuels. This panel was to provide guidance to the HABC on which alternate fuel sources appear to hold the most promise in reducing energy costs near term or in the future.

The panel developed the objectives, alternatives, and evaluation parameters which follow. The alternatives are summarized in Table 1, the parameters in Table 2. Each objective was evaluated in terms of the parameters listed *in the context of the HABC application.* Implicit in this was consideration of Baltimore's unique geography, topography, and access to national transportation systems. All alternatives were initially evaluated to determine if exclusions "by inspection" were possible. Of the 24 major alternatives (Matrix 3A) considered, 11 were thereby eliminated. These are marked by "x" in Matrix 3A. An "x-rating" of an alternative eliminated it from further consideration or evaluation in Matrix 3B. The remaining 13 were rated and ranked by assigning value determinations on a scale of 1 (poor) to 4 (excellent) for each evaluation parameter (Matrix 3B). Multipliers were applied by the panel members to reflect the importance of the parameter. The result was a numerical rating and ranking of alternatives as shown in Matrix 3B. The listing, in ranked order, is shown on Table 3 along with a logical grouping of alternatives into short, mid, and long range solutions.

OBJECTIVES

1. Evaluate alternate available fuels that can be of assistance to the HABC in reducing their energy bills.

2. Determine parameters that can be of assistance in the evaluation of best fuels available.

3. Recommend fuels for short term or long term usage by the HABC.

DEFINITION OF ALTERNATIVES*

Solar Active–heat collection systems utilizing solar energy and requiring mechanical equipment such as fans, pumps, etc., for fluid movement.

Solar Passive–solar systems which rely upon building design, construction and natural effects for space heating and/or control of heat influx.

Photovoltaics–direct conversion of solar energy to electricity.

*Alternatives that were considered unfamiliar or likely to be confusing are defined. Some items that were eliminated from consideration in Matrix 3B are included.

Hydroelectric—in this instance, refers to utilization of the hydraulic head of existing water supply systems for operation of small turbine generators.

Ocean Thermal Energy Conversion (OTEC)—utilization of the temperature difference between surface and deep waters to produce electricity (or other fuel products, such as hydrogen).

Coal/Oil Mixture—a mixture of fuel oil and finely pulverized coal.

Biomass Solids—primarily waste materials such as wood chips, agricultural crop wastes, etc., or processed organic materials such as aquatic plants, algae, etc.

Biomass Liquids—liquid fuels derived from organic materials, such as ethanol from grains or methanol from wood or coal.

Biomass Gas—primarily methane from decomposition of wastes (landfills, manure conversion, etc.).

Waste—mass—bulk wastes, primarily mixed refuse.

Waste—processed—primarily municipal solid waste which has been classified, shredded, dried and converted to a form usable as solid fuel.

Waste, liquids—discarded crankcase oil, contaminated non-carcinogenic fuels, and other liquid wastes which can be sufficiently cleaned for use as fuel.

Waste heat—heat rejected from industrial processes in reasonable proximity to the housing units.

DEFINITION OF PARAMETERS*

Dependability of supply—considers the ease with which fuel may be acquired, the long-term outlook for the primary source, and the reliability of production and delivery.

Inflation sensitivity—the magnitude of inflationary impact on the parameter with the passage of time.

Social impact—intangible effects such as public perceptions, annoyance factors, lifestyle disturbances, etc.

Institutional constraints—restrictions placed upon the parameters by the institutions of society, such as legal, zoning, aesthetics, environmental.

Adaptability—the potential for implementing use of the fuel in the overall system now utilized in the housing unit.

Symbiosis—the degree to which the solution to a given problem also aids in the solution to another.

*Only parameters unfamiliar or likely to be confusing are defined.

Table 1

Alternatives

1. Solar	2. Fossil Fuels	3. Synthetic Fuels	4. Nuclear	5. Geothermal	6. Biomass	7. Solid Waste	8. Electricity	9. Waste Heat	10. Fuel Mixtures
Active	Oil	Lo/Mid BTU Gas			Solid	Unprocessed			
Passive	Gas	Liquified Coal			Liquid	Processed			
Photovoltaic	Coal	Shale Oil			Gas				
Wind									
Hydro									
Ocean Thermal (OTEC)									
Tidal									

Table 2

Parameters

1. Dependability of Supply	2. State of the Art	3. Economics	4. Inflation Sensitivity	5. Environmental	6. Social Impact	7. Institutional Factors	8. Distribution and Storage	9. Adaptability to Present Plant	10. Symbiosis
Short term		Capital	Construction Time	Emissions		Political			
Long term		O&M	Fuel Costs	Noise		Regulatory			
				Solids					

MATRIX 3A

Parameter \ Alternative	Solar Thermal - Active	Solar Thermal - Passive	Photovoltaic	Wind	Hydro	OTEC	Tidal	Oil	Gas	Coal	Low Btu Gas	Med Btu Gas	Liquid Coal	Shale Oil	Nuclear	Geothermal	Biomass Solid	Biomass Liquid	Biomass Gas	Solid Waste (Unprocessed)	Solid Waste (Processed)	Electricity	Waste Heat	Fuel Mixtures
Supply Dependability—Short Term	√	√	√	x	√	x	x	√	√	√	x	x	x	x	√	x	√	x	x	√		√	x	√
Supply Dependability—Long Term	Alternatives considered too speculative to be included (except for Processed Solid Waste)																				√			
State-of-the-Art	2	3	√	√	4	x	x	4	4	4	x	x	x	x	√	x	3	x		3	2	4	4	2
Capital Cost	2	3	x	x	2			3	4	1							1			1	1	2	1	3
Operation & Maintenance Cost	3	4			3			1	3	1							2			1	2	3	4	2
Inflation Sensitivity—Construction	3	4			4			4	3	2							2			2	2	3	2	3
Inflation Sensitivity—Fuel	4	4			4			1	2	2							3			4	2	2	4	2
Emissions	4	4			4			3	4	4							4			4	4	4	4	4
Noise	4	4			4			4	4	3							3			2	3	4	4	4
Solids	4	4			4			4	4	2							3			1	3	4	4	3
Social Impact	4	4			4			4	4	2							3			1	3	4	4	4
Political Factors	4	4			1			2	3	4					x		3			2	4	3	4	3
Regulatory Factors	3	4			4			2	3	1							3			3	3	4	4	1
Distribution and Storage	3	4			2			3	4	1							1			1	2	4	4	3
Adaptability to Present Plant	2	2			2			4	4	1							1			1	1	2	2	3
Symbiosis	1	2			2			1	1	1							2			4	4	1	2	1

1 – Poor 2 – Fair 3 – Good 4 – Excellent

√ - Acceptable x - Not acceptable for further consideration

MATRIX 3B

Parameter \ Alternative	Thermal – Active	Thermal – Passive	Hydro	Fossil Fuel – Oil	Fossil Fuel – Gas	Fossil Fuel – Coal	Biomass – Solid	Solid Waste (Unprocessed)	Solid Waste (Processed)	Waste Liquids	Electricity	Waste Heat	Fuel Mixtures			Multipliers
State-of-the-Art	2	3	4	4	4	4	3	3	2	4	4	4	2			3
Economics																
Capital	2	3	2	3	4	1	1	1	1	3	2	1	3			3
Oper. & Main.	3	4	3	1	3	1	2	1	2	3	3	4	2			
Inflation Sensitivity																
Conservation	3	4	4	4	3	2	2	2	2	4	3	2	3			½
Fuel	4	4	4	1	2	2	3	4	2	3	2	4	2			
Environmental*																
Emissions	4	4	4	3	4	4	4	4	4	4	4	4	4			2
Noise	4	4	4	4	4	3	3	2	3	4	4	4	4			
Solids	4	4	4	4	4	2	3	1	3	4	4	4	3			
Social Impact	4	4	4	4	4	2	3	1	3	4	4	4	4			1
Institutional Factors																
Political	4	4	1	2	3	4	3	2	4	4	3	4	3			2
Regulatory	3	4	4	2	3	1	3	3	3	3	4	4	1			
Distribution and Storage	3	4	2	3	4	1	1	1	2	3	4	4	3			1
Adaptability to Present Plant	2	2	2	4	4	1	1	1	1	3	2	2	3			1
Symbiosis	1	2	2	1	1	1	2	4	4	3	1	2	1			1
Score (Multiplier Times Matrix Factor)	80	96	83	72	89	57	62	56	65	91	83	91	67			
Rank	5	1	4	6	3	10	9	11	8	2	4	2	7			

1 – Poor 2 – Fair 3 – Good 4 – Excellent

*Must Meet EPA Standards

Table 3

Time Line

Alternatives	Considerations
1 – Solar Passive	Supplemental
2 – Waste Liquid	Site Specific
3 – Waste Heat	Capital Cost Low
4 – Hydro	Good Payback
5 – Natural Gas	Cost Effective–Near Term
6 – Electricity	High Reliability
7 – Solar Active	Refinements in O&M
8 – Oil	Product Savings
9 – Fuel Mixtures	If Oil Still Used
10 – Biomass	Capital Costs High
11 – Processed Wastes	Environment Concerns
12 – Coal	Materials Handling Problems
13 – Mass Burning of Refuse	Questions of Scale

CONCLUSIONS

1. The HABC should strongly pursue solar passive programs.

2. The HABC should actively seek waste oils to stretch present supplies and negotiate with industrial or commercial firms who may have available process waste heat sources in close proximity to power plants or housing units.

3. Hydro power from the city water supply system should be investigated following conclusion of negotiations for "wheeling" power agreements with the city and BG&E.

4. Conversion to natural gas should be completed while retaining dual fuel capacity.

5. Burning of solid fuels (coal, biomass, processed or unprocessed waste) is not feasible in the short term due to various factors (high capital costs, social and political factors, materials handling problems and economies of scale).

6. Recommend that the HABC take a hard look at locations having large fuel oil storage tanks (those accommodating 7,000 gallons or greater delivery) presently served by tank-wagon delivery (small delivery, i.e., under 7,000 gallons) because access to fill pipes is not available to permit truck transport delivery (i.e., 7,000 gallons or greater). Where economically feasible, fill pipes should be relocated as soon as possible to permit delivery by truck transport thereby achieving additional economies.

7. Electricity may be one of the best near term solutions where a central hot water or air system can be modified to use it. The use of heat pumps should be investigated and encouraged even where cooling systems are not provided.

8. The use of solar active systems for domestic hot water systems should be encouraged where applicable and possible. It would be valuable in garden type apartments where maintenance would be simplified.

9. If liquid fuel (oil) is used, one short term solution is a coal oil mixture. Its use is now in pilot plant stage but can be a viable option in the near future.

These conclusions indicate that most of the more exotic fuels (unprocessed and processed waste, biomass and coal) are not indicated as the answer for a system as politically, socially or environmentally sensitive as the HABC's. It would take a significant increase in present fuel costs to justify the capital costs required to make the change to coal or garbage. Even then, attitudes and perceptions of residents would have to be modified before extensive use of these less acceptable fuels would be possible. In the short term, serious attempts should be made to extend use of solar systems, particularly for domestic hot water, and to develop sources of waste heat and/or combustible waste liquid in the industrial community of Baltimore. None of these (solar, waste heat or liquids) will provide a system-wide alternative, but could give some relief in various "smaller" segments of the HABC system. The group felt that increased use of electricity to provide hot water or building heating should be thoroughly explored. If the local utility switches to coal fired power generating systems, electricity could become one of the least expensive readily available fuels. This saving might be reflected in the fuel surcharge portion of the cost.

APPENDIX A – Letter of Invitation

CITY OF BALTIMORE

WILLIAM DONALD SCHAEFER, Mayor

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

M. J. BRODIE, Commissioner
222 East Saratoga Street, Baltimore, Maryland 21202

August 14, 1980

H. J. Peake
Code 702
Goddard Space Flight Center
Greenbelt, Maryland 20771

Dear Mr. Peake:

The Housing Authority of Baltimore City, in cooperation with the National Needs Office of NASA Goddard Space Flight Center, is sponsoring an energy workshop at the Tidewater Inn, Easton, Maryland, Sunday September 21 at 4 p.m. (social hour) through Tuesday, September 23 at 3 p.m. (adjourn).

The purpose of the workshop is to explore in considerable detail the potential for achieving energy cost savings in low cost housing. Spiraling energy costs are seriously affecting the viability of the continued operations and production of low cost housing.

We consider your participation in this workshop to be a most vital contribution to the development of energy alternatives.

The planned format calls for 3 discrete working groups engaged simultaneously as follows: (1)district heating and other alternatives (2) conservation methods and motivation and (3) fuel options. We would like to have your representation as a workshop coordinator.

The Housing Authority of Baltimore City will underwrite all housing and meal costs. However, it is expected that attendees will provide for their own transportation.

We would appreciate an early response, telephone would be fine -- please call Deputy Commissioner John McCauley at 396-3242, advising us of your participation. More detail as to agenda, etc. will be promptly forwarded to the participants.

Sincerely,

M. J. BRODIE
Commissioner

APPENDIX B – Workshop Schedule

Panel Procedures Provided Before Sessions

Workshop Output Instructions Provided Before Sessions

ENERGY WORKSHOP

SEPTEMBER 21-23, 1980

Schedule

September 21

4:00 p.m.	Registration
5:30 p.m.	Cash Bar
5:30 p.m.	Dinner
7:30 p.m.	Brief History of the Public Housing Program--J. Van Story Branch
8:00 p.m.	Panel Organization Meetings

September 22

7-8:00 a.m.	Breakfast
9:00 a.m.	Opening Remarks--John McCauley
9:30 a.m.	Panel Operation Discussion--Tom Golden
9:45 a.m.	Coffee
10:00 a.m.	Panel Session
12:00 p.m.	Lunch
1:00 p.m.	Panel Leaders Meeting--Tom Golden
1:30 p.m.	Panel Session
2:30 p.m.	Coffee
2:45 p.m.	Panel Session
5:30 p.m.	Cash Bar
6:30 p.m.	Dinner
8:30 p.m.	Panel Session--Outline Report

September 23

7-8:00 a.m.	Breakfast
9:00 a.m.	Panel Sessions
10:30 a.m.	Coffee
10:30 a.m.	Panel Reports--I
11:00 a.m.	Panel Reports--II
11:30 a.m.	Panel Reports--III
12:00 p.m.	Wrap Up
12:15 p.m.	Lunch--Adjourn

PANEL PROCEDURES

It is suggested that each panel begin with a brainstorming session, an exercise in creativity to identify as many objectives as possible without regard to the practicality or importance. During this exercise it is important to scrupulously avoid criticizing or evaluating ideas so that there free flow is not inhibited. Often absurd initial ideas lead to other feasible suggestions. Once the flow of ideas runs dry, it is appropriate to critique each one.

After the participants have had a night to sleep on the problem, it may be worthwhile to solicit additional ideas before formalizing the final draft.

The panel should endeavor to identify places where their problem interfaces with other workshop panels, and discuss these with those panels so these aspects will be properly coordinated with the final panel conclusion and report.

The following is a recommended agenda for each panel:

1. Brainstorm alternative—no critique.
2. Brainstorm parameters—no critique.
3. Brainstorm evaluation criteria—no critique.
4. Critique and prioritize evaluation criteria.
5. Critique and prioritize parameters.
6. Critique and prioritize alternatives.
7. Draft matrix.
8. Critique.
9. Identify and explore. Interface with other panels.
10. Finalize matrix.
11. Prepare verbal report for workshop.
12. Prepare written report.

WORKING OUTPUT

Each workshop panel will leave behind, before departing on Tuesday, a handwritten report describing the panel conclusions. Verbal report on these conclusions will be given by each panel to the assembled workshop beginning Tuesday morning.

Each panel will consider alternative concepts for addressing problems within its scope in various parameters which must be considered in analyzing the practicality of the concept.

It's suggested that each panel's report be based on a matrix with the alternative as columns and the parameters as rows. Symbols in the matrix squares will show the importance of the parameter to the alternative (● = very important, o = slightly important, blank space = unimportant). A sample of such a matrix is attached and blank forms are provided.

The panel report should follow the following outline:

1. Panel objectives
2. Panel conclusions

   (Presentation of matrix and summary of highlights)
3. Description of Alternative
   - 3.1 Alternative 1
   - 3.2 Alternative 2
   - . . .
4. Description of important parameters
   - 4.1 Parameter 1
   - 4.2 Parameter 2
   - . . .
5. Description of criteria for evaluation parameter importance
   - 5.1 Criterion 1
   - 5.2 Criterion 2
   - . . .
6. List of panel participants with affiliation and mailing address

Alternative / Parameter											

● – Important o – Should be Considered Blank – Unimportant

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15. Supplementary Notes

16. Abstract The upward trend in fuel cost is making itself felt on the quality and in some cases the very existence of adequate low cost public housing. The City of Baltimore has a very fine record on most counts in the quality, services and general tenant satisfaction and participation throughout their public housing. These factors are threatened by increasing energy costs. The budget for water, electricity, gas and oil has increased from $8.8 million in 1978 to $13.8 million in 1980 and it is expected to continue rising.

The NASA/Baltimore Applications Project operating at the Goddard Space Flight Center was called upon by the Housing Authority of Baltimore City (HABC) to consider the situation and suggest methods for correction and alleviation. The first step chosen was to elicit as many different options for solution as possible through means of a Public Housing Energy Workshop held in Easton, Md. in September 1980. A final role for the Workshop was a listing and qualifying of each alternative as to its suitability and cost. Specific areas were examined by three panels: 1) Systems, 2) Conservation and Motivation, and 3) Fuels. Each panel was made up of persons from differing but appropriate backgrounds; membership was not restricted to "housing people" alone. This report is a summary of their deliberations--it will be used as a stepping stone to further selection and implementation of alternatives.

17. Key Words (Selected by Author(s))	18. Distribution Statement
Energy cost savings Public housing Alternative energy systems Alternative fuels Conservation Tenant motivation	

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