GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[x] ORIGINAL [ ] REVISION NO. _____

Project No. A-3760 GTRI/~~GIT~~ DATE 2 / 21 / 84

Project Director: Tom McGowan ~~School~~/Lab TAL/ET

Sponsor: Georgia Solar Coalition; Atlanta, GA

Type Agreement: Std. Industrial Agreement dtd. 1/1/84

Award Period: From 1/1/84 To ~~6/30/84~~ 8-31-84 (Performance) 6/30/84 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated: $		$6,639
Funded: $		$6,639

Cost Sharing Amount: $ _____ Cost Sharing No: _____

Title: Residential Solar Workshop

ADMINISTRATIVE DATA — OCA Contact John W. Burdette x4820

1) Sponsor Technical Contact:

2) Sponsor Admin/Contractual Matters:

Mr. Dennis Creech
Georgia Solar Coalition
P.O. Box 5506
Atlanta, GA 30307

Defense Priority Rating: n/a Military Security Classification: n/a

(or) Company/Industrial Proprietary: n/a

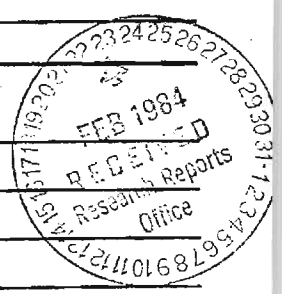
RESTRICTIONS

See Attached ----- Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval — Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with none proposed

COMMENTS:



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Accounting	Research Communications (2)	Other NEWTON

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 11/27/84

Project No. A-3760 ~~School~~/Lab TAL

Includes Subproject No.(s) N/A

Project Director(s) Tom McGowan GTRC / ~~GIT~~

Sponsor Georgia Solar Coalition; Atlanta, GA.

Title Residential Solar Workshop

Effective Completion Date: 6/30/84 (Performance) 6/30/84 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [x] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other _____

Continues Project No. _____ Continued by Project No. _____

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A. Jones

A-3760

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
Atlanta, Georgia 30332

March 8, 1984

Mr. Dennis Creech
The Georgia Solar Coalition
P.O. Box 5506
Atlanta, GA 30307

Dear Dennis:

Enclosed is the progress report for January and February on Project A-3760, "Residential Solar Workshops."

Please call me at 894-3636 if you have any questions.

Sincerely,

Thomas F. McGowan
Chief, Energy Technology Branch

TFM/pk

Enclosure

Progress Report
Project A-3760
Residential Solar Workshops
January and February 1984

General discussions were held with the Georgia Solar Coalition about the project and contractual details.

Work began in earnest in February when the contract was signed. A meeting was held at the GSC office to discuss schedules and content of the Energy Clinics on February 14, and a follow-up meeting held on February 28. The Georgia Tech segment of the project is summarized below:

Workshops Scheduled

Thursday, February 16, 3:00-9:00 PM	Atlanta Civic Center; "Builders Only Trade Show"
Saturday, March 10, 10:00 AM - 9:00 PM	Cobb County Civic Center; Home Show
Saturday, April 7, 10:00 AM - 4:00 PM	Milledgeville
Saturday, May 12, 10:00 AM - 4:00 PM	Norcross High School

Material to be generated: Two Energy Clinics on (1) Wood Heating, and (2) Heating, Ventilating/Air Conditioning Systems.

Several items have been accomplished as of the end of February. They include manning the booth at the February 16 Builders Only Trade Show, and production of rough drafts of material for the energy clinics. Some materials have been obtained (e.g., chimney pipes for display) and others are being ordered. A fact sheet on wood stove catalysts, previously produced by Georgia Tech, was recently released by OER and will be used in the wood stove clinic. A second fact sheet on home heating systems was recently completed (under a second contract) and should be ready by the end of April.

Work for next month includes a workshop in Cobb County on March 10, and production of finished energy clinic materials.

Budget and Expenditures

Since the project was recently initiated, the first set of budget sheets has not yet been released. Projected expenditures for February are approximately $1,000. Attendance at the Atlanta Civic Center Builders Conference was not included in the scope of work and will be paid for via additional contract funding.

A-3760

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
Atlanta, Georgia 30332

April 20, 1984

Mr. Dennis Creech
The Georgia Solar Coalition
P.O. Box 5506
Atlanta, GA 30307

Dear Dennis:

Enclosed is the progress report for March on Project A-3760, "Residential Solar Workshops."

Please call me at 894-3636 if you have any questions.

Sincerely,

Thomas F. McGowan
Chief, Energy Technology Branch

TFM/pk

Enclosure

Progress Report
Project A-3760
RESIDENTIAL SOLAR WORKSHOPS
March 1984

The major work for this month was preparation for the March 10th Cobb County Civic Center Home Show presentation. Tom McGowan accompanied Dennis Creech and other Georgia Solar Coalition personnel for the Saturday session. The Home Show was well attended with a steady stream of people interested in energy conservation and solar topics. Tom McGowan also gave a 30 minute slide presentation on energy conservation at the Home Show.

The heating system and woodstove layouts were 80% complete in March and will be finished in time for the April 7th Clinic in Milledgeville. Both layouts consist of graphics and text on three poster boards for easy viewing by people attending the Energy Clinics.

Project expenditures for January/February were $783. March expenditures were $1,501. Total expenditures are $2,284 or 34% of the total budget versus 3 months out of a 6 month project, or 50% time elapsed.

A-3760

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
Atlanta, Georgia 30332

May 16, 1984

Mr. Dennis Creech
The Georgia Solar Coalition
P.O. Box 5506
Atlanta, GA 30307

Dear Dennis:

Enclosed is the progress report for April on Project A-3760, "Residential Solar Workshops."

Please call me at 894-3636 if you have any questions.

Sincerely,

Thomas F. McGowan
Chief, Energy Technology Branch

TFM/pk

Enclosure

Progress Report
Project A-3760
RESIDENTIAL SOLAR WORKSHOPS
April 1984

Tom McGowan accompanied GSC and OER personnel to Milledgeville, Georgia, to present a workshop on Saturday, April 7. He presented two slide shows on Energy Conservation and Wood Heating; and answered detailed and general questions from homeowners and builders.

Project expenditures for April were $1,230. Total expenditures are $3,514 or 53% of the total budget versus 4 months out of a 6-month project, or 67% time elapsed.

A-3760

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
Atlanta, Georgia 30332

June 5, 1984

Mr. Dennis Creech
The Georgia Solar Coalition
P.O. Box 5506
Atlanta, GA 30307

Dear Dennis:

Enclosed is the progress report for May on Project A-3760, "Residential Solar Workshops."

Please call me at 894-3636 if you have any questions.

Sincerely,

Thomas F. McGowan
Chief, Energy Technology Branch

TFM/pk

Enclosure

Progress Report
Project A-3760
RESIDENTIAL SOLAR WORKSHOPS
May 1984

Tom McGowan accompanied GSC personnel to Norcross, Georgia, to present a workshop on Saturday, May 12. He presented two slide shows on Energy Conservation and Wood Heating; and answered detailed and general questions from homeowners and builders. Of note were three people who attended the workshop armed with full blueprints of the house they were about to build. This type of person is, to say the least, very interested in specific answers to their energy questions.

Work is underway on a slide tape show on wood heating. The slides have been duplicated and a first attempt made at producing a script.

The Office of Energy Resources now has the "Choosing a Heating System" fact sheet available. A surprising amount of questions on furnace selecting have been received by phone recently and the fact sheet (attached) allows for a fast, comprehensive response.

Project expenditures for April were $1,532.31. Total expenditures are $5,046.49 or 76% of the total budget versus 5 months out of a 6-month project, or 83% time elapsed.

OFFICE OF ENERGY RESOURCES
270 Washington Street, S.W.
Suite 615
Atlanta, Georgia 30334

Fact Sheet

Choosing a Home Heating System

Heating systems provide winter comfort and last many years with relatively little maintenance. However, when the system becomes old and unreliable, or the cost of fuel calls for replacement with a more efficient model, the homeowner is faced with a major decision.

This fact sheet contains information on heating systems to help the homeowner make the best choice in selecting a replacement system. Much of the information also applies to choosing a system for new homes.

TYPES OF HEATING SYSTEMS

The majority of homes in Georgia are heated by forced air furnaces fueled with natural gas. Electric furnaces which use resistance heating coils are frequently used in small homes and are less expensive in first cost, but are only half as efficient as electric heat pumps. All warm air systems use ducts to carry heated air from the furnace to each room where it is distributed by heat registers or grills mounted in wall, floor or ceiling. These ducts should be insulated whenever they are in an unconditioned space.

Other, less frequently used, central systems distribute heat by recirculated hot water or steam. A small percentage, usually in rural areas, are fueled with propane or fuel oil. If you are not sure of the type of system you currently have, check the nameplate on the furnace or boiler or call a qualified heating contractor for an inspection.

Only warm air systems can be readily adapted to air conditioning; hot water or steam systems require that a separate duct system be installed to distribute the cool air.

SIZING THE SYSTEM

For replacement systems, the starting point for determining the correct size (or "sizing") is to check the existing heating system "nameplate rating." This is a metal tag attached to the unit, usually near the control valves or wiring box. A typical unit size for an average home (1,600 square feet of floor space) is about 80,000 Btu/hr input. While this is typical, using "rule of thumb" sizing or assuming that the existing system is properly sized can be a mistake and may lead to reduced comfort, higher utility bills and greater installation costs.

Existing heating systems are frequently oversized, particularly if more insulation has been added to the home. This oversizing is apparent when a system runs intermittently during very cold weather. In Georgia, heating systems should run almost continuously when the outside temperature is below 20 degrees Fahrenheit.

Homes that have been insulated, fitted with storm windows and generally tightened up require less heat than they did when they were built. On the other hand, adding extra rooms or finished basements and attics may mean the home requires a larger system. Thus, before sizing and buying a system, go ahead and make energy conservation improvements (such as insulation) and calculate in the extra living space you may add later.

Sizing is a complex problem best done by professionals. This service is often available free to homeowners from several sources, including:

- the gas and electric utilities
- major heating equipment manufacturers
- heating and air conditioning contractors

The homeowner may need to provide data on the size of the house, number of windows, etc., as guidelines for determining heating load estimate. Atlanta Gas Light Company, Georgia Natural Gas Company, Georgia Power Company, Savannah Electric and Power Company, Savannah Gas Company, and many Electric Membership Corporations (EMCs) and Municipal Electric Systems help homeowners and contractors with system sizing.

Another sizing consideration is the efficiency of the system. Contractors normally use the heat input rating when choosing a unit. However, the new, more efficient furnaces may produce 25% more heat than older models with the same input rating. So, heating systems today should be selected by the output rating — not the input rating. Once the correct size of the system is determined, the homeowner is prepared to get estimates from heating contractors.

(1983) fuel costs of 56 cents per therm for natural gas, 5.1 cents per Kwh for electricity, $1.00/Gallon for fuel oil and $.90/gallon for propane were used in the calculations.

TOTAL COST OF OPERATION

As previously discussed, the yearly total cost of a heating system is the sum of the installed cost (amortized over its useful life), maintenance cost and fuel costs. Since fuel costs are fixed by market price, the only factors under the control of the homeowner are the efficiency and the installed cost of the heating system. These cost relationships are shown in Figure 1, for groups of heating systems using a given fuel.

OLD, UNUSUAL HEATING SYSTEMS

Many homeowners have old furnaces which differ radically from today's usual equipment. The best choices for replacing these systems are discussed below:

Gravity Warm Air Systems: These central furnaces were installed in the 1920-1940's and were frequently fueled with coal. Many were later converted to natural gas, and some had forced air blowers added. These systems use large ducts (10"-24") to carry air by "gravity," (that is, the difference in density between hot and cold air that causes hot air to rise). The heat loss from these ducts is enormous and the cost to insulate them prohibitive. The best solution is to replace the furnace ductwork with smaller diameter insulated duct and install a modern forced air heating system. This changeover should include insulation of the water pipes under the house to prevent freezing which may be caused by lower basement temperatures.

Floor Furnaces: These have a large single grate in the floor (usually only one or two for an entire house) where cool air enters the perimeter and hot air rises from the middle. While they are still available, they do not come in high efficiency models. A replacement with a pilotless ignition is probably the best solution; if air conditioning is desired, a central heating system with insulated ducts is best.

Table 2

Payback Period for More Efficient Equipment

(Does Not Include Ductwork)

Type	Efficiency	Extra Cost	Annual Fuel Savings*	Payback Period**
Natural Gas Furnace	AFUE			
Standard Efficiency	65%	–	–	–
Intermittent Ignition	70%	$ 200	$ 35	6 yrs
High Efficiency Combustion	83%	650	105	6 yrs
Condensing Heat Exchanger	95%	1350	153	9 yrs
Heat Pump	HSPF			
Standard Efficiency	6.0	–	–	–
Medium Efficiency	7.0	194***	$ 67	3 yrs
High Efficiency	8.0	418***	117	4 yrs

**Compared to standard model*

***These are for payback of the extra cost of a unit with a higher efficiency than the standard for the particular equipment type.*

****These are extra costs for heating portion only.*

Table 3

Maintenance Costs and Equipment Life for Heating Systems

Type	Annual Maintenance Cost*	Equipment Life
Gas and Propane Furnaces	$ 15	20 yrs.
Electric	15	20
Heat Pump	30*	11
Fuel Oil Furnaces	40	18

** This is ½ the annual maintenance cost which reflects the heating portion only.*

A-3760

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
Atlanta, Georgia 30332

July 20, 1984

Mr. Dennis Creech
The Georgia Solar Coalition
P.O. Box 5506
Atlanta, GA 30307

Dear Dennis:

Enclosed is the progress report for Project A-3760, "Solar Workshops," for the month of June 1984. July is the last month of the project (a request was sent previously to request this extra month) and July's progress report will also be the final report on the project.

Sincerely,

Thomas F. McGowan
Chief, Energy Technology Branch

TFM/pk

Enclosure

Progress Report
Project A-3760
RESIDENTIAL SOLAR WORKSHOPS
June 1984

No workshops were presented in June by Georgia Tech personnel. The slide-tape show on heating with wood is the remaining contract deliverable to be completed. The script was drafted in June and slides were duplicated. The script will be checked in July and the narration finished in that month.

A request for an extension for July to complete the work will be sent to the Georgia Solar Coalition. Accompanying this request is a budget for additional funds to cover the principal investigator's attendance at the "For Builders Only" workshop at the Atlanta Civic Center.

BUDGET

June expenditures were $2,382. Cumulative expenditures were $7,428, or $789 over budget. The extra funds provided by the budget amendment will reduce the overrun at close-out of the project.

A-3760

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
Atlanta, Georgia 30332

August 3, 1984

Mr. Dennis Creech
The Georgia Solar Coalition
P.O. Box 5506
Atlanta, GA 30307

Dear Dennis:

Enclosed is the final report for Project A-3760, "Solar Energy Workshops," for the period from January 1, 1984, through July 31, 1984.

I enjoyed working with you and your staff on this project and hope we can collaborate on similar ventures in the future.

Sincerely,

Thomas F. McGowan
Chief, Energy Technology Branch

TFM/lmk

Enclosure

Final Report
Project A-3760
RESIDENTIAL SOLAR WORKSHOPS

The scope of this project was to prepare material on energy conservation and wood energy for homeowners/homebuilders and make presentations to the public.

Two "Energy Clinics" were generated, on "Wood Heating" and "Heating, Ventilating/Air Conditioning Systems," plus a slide tape show on wood heating. Tom McGowan made presentations and manned the booth at the following workshops:

1. Builders Only Trade Show, Atlanta, February 16, 1984
2. Cobb County Civic Center Home Show, March 10, 1984
3. Milledgeville College, April 7, 1984
4. Norcross High School, July 12, 1984

Other tasks included assisting in publicity for the workshops and responding to frequent requests for information from the general public, builders, and the gas and electric utilities.

These activities were the scope of work for the project and all of them have been completed by July 31, 1984.

BUDGET

The entire budget of $6,639 has been expended. A contract modification of an additional $390 has been requested for the fourth workshop (Builders Only Trade Show) which was not included in the scope of work but was verbally authorized by OER in February 1984. This additional amount, when authorized by GSC, will be added to the total budget, resulting in a new total of $7,029.