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July 27, 2009

BY HAND DELIVERY
Ms. Ann Cole, Commission Clerk
Office of Commission Clerk
Room 110, Easley Building
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, Florida 32399-0850

Re: Docket No. 090122-EG

Dear Ms. Cole:

Enclosed for filing on behalf of Associated Gas Distributors of Florida are an original and five copies of Associated Gas Distributors of Florida's Responses to Staff's Data Request in the above referenced docket.

Please indicate receipt of these documents by stamping the enclosed extra copy of this letter "filed and returned the same to me.

Thank you for your assistance with this filing.

Sincerely yours,

Norman H. Horton, Jr.

COM ____
ECR ____
GCL 1
OPC ____
RCP ____
SSC ____
SGA ____
ADM ____
CLK ____

NHH/amb
Enclosures
cc: Mr. Stuart Shoaf
Parties of Record

Regional Center Office Park / 2618 Centennial Place / Tallahassee, Florida 32308
Mailing Address: P.O. Box 15579 / Tallahassee, Florida 32317
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AGDF's Responses to STAFF'S DATA REQUEST

Re: Docket No. 090122-EG, Associated Gas Distributors of Florida's Petition for Approval of Modifications to Approved Energy Conservation Programs

1. **What will be the rate impact of the Conservation Demonstration and Development Program, in cents per therm and dollars per average residential monthly bill?**

AGDF's Response: Please see attached.

2. **Please provide annual cost estimates, in dollars and % of total conservation expenses for the program and its components, including incentives, administrative, consumer education or marketing costs, research, development, and demonstration costs for the period 2009 through 2014.**

AGDF's Response: Please see attached.

3. **Please explain or describe whether the members of the Associated Gas Distributors of Florida (AGDF) monitor their existing programs.**

   a. **If the response is yes, how much are these costs?**

   b. **Please explain or describe whether any costs are included in the cost-effective analysis of any program as an administrative or other cost.**

   c. **If the response is yes, please explain or describe how are these costs recovered.**

AGDF's Response: Please see attached.

4. **Please explain or describe whether the members of the AGDF conduct any form of annual or semi-annual review, to reflect changes in building codes, energy efficiency standards, or other changes.**

   a. **If the response is yes, how much are these costs?**

   b. **Please explain or describe how these costs are recovered.**

   c. **Please explain or describe whether any of these costs are included in the cost-effective analysis of any program as an administrative or other cost.**

   d. **If the response to 4 is no, please explain or describe how existing programs reflect changes in building codes or energy efficiency standards.**

AGDF's Response: Please see attached.

5. **Please explain or describe whether the members of the AGDF currently engage in literature searches, consumer behavior evaluations, market evaluations, and other activities to improve marketing.**

   a. **If the response is yes, how much are these costs?**

b. Please explain or describe whether any costs are included in the cost-effective analysis of any program as an administrative or other cost.

c. If the response is yes, please explain or describe how are these costs recovered.

AGDF's Response: Please see attached.

6. Please explain or describe whether the members of the AGDF engage in research into marketing, customer participation strategies, consumer education, appliance selection, fuel selection, or research related to these topics.

a. If the response is yes, how much are these costs?

b. Please explain whether any costs are included in the cost-effective analysis of any program as an administrative or other cost.

c. If the response is yes, please explain or describe how are these costs recovered.

AGDF's Response: Please see attached.

7. Please refer to the Conservation Demonstration and Development Program's research into marketing, customer participation strategies, consumer education, appliance selection, fuel selection, or research related to these topics, please provide a listing of the anticipated use of funds for these topics. As part of this response, please describe each project.

a. Please explain or identify the specific metrics that will be used to assess the effectiveness of any funds used.

AGDF's Response: Please see attached.

8. Please explain or describe whether the marketing expenses made with the Conservation Demonstration and Development Program will be used to promote any other conservation programs, or natural gas in general. As part of this response, please include any anticipated amounts.

AGDF's Response: Please see attached.

9. The petition describes in paragraph 18 that funds will be used to investigate consumer and homebuilder fuel type decision making. Please identify how much of these funds will focus on natural gas conservation.

AGDF's Response: Please see attached.

10. **In paragraph 18 of the petition, it states that research will be devoted to creating more effective incentive programs. Please explain or describe how this would be accomplished. Please identify the amount of funds that would be dedicated to creating more effective incentive programs.**

AGDF's Response: Please see attached.

11. **In paragraph 18 of the petition, it states that research will be devoted to creating more effective consumer education programs. Please explain or describe how this would be accomplished. Please identify the amount of funds that would be dedicated to creating more effective consumer education programs.**

AGDF's Response: Please see attached.

12. **Please explain or identify the demographics or targeted audience (residential, commercial, industrial, income brackets, etc.) of the proposed research. Also, please explain or describe whether the focus will be upon natural gas appliance users or electric appliance users.**

AGDF's Response: Please see attached.

13. **Please explain or describe whether any existing programs from AGDF's members allow a ratepayer to qualify for a rebate or other incentive for installation of a gas tankless water heating system.**

    a. **Please explain or describe whether a ratepayer could qualify under any of these programs if the gas tankless water heating system was installed as a backup to or in conjunction with a solar thermal water heating system.**

    b. **If ratepayers do not qualify for incentives or rebates, could the utility modify any existing programs to allow incentives for these combinations?**

AGDF's Response: Please see attached.

14. Please explain or describe why AGDF is seeking approval of Solar Thermal / Gas Tankless water heating systems as a component of the Conservation Demonstration and Development Program instead of as a pilot program.

a. Please explain or describe how pilot programs would differ from the demonstration projects proposed in this petition.

b. Please explain or describe the type of information being gathered in these demonstrations.

c. The petition states in paragraph 18 that such systems are 'highly efficient.' Please explain or describe any previous research or development done for Solar thermal / gas backup water heaters.

AGDF's Response: Please see attached.

The following questions address compressed natural gas (CNG) vehicles.

15. Please explain or describe whether any members of the AGDF have any previous experience with CNG vehicles.

AGDF's Response: Please see attached.

16. Please explain or describe whether any members of the AGDF have any special rates or other programs relating to CNG vehicles.

AGDF's Response: Please see attached.

17. Please explain or describe whether any members of the AGDF are investigating conversion of existing conventional vehicles.

AGDF's Response: Please see attached.

18. Please explain or describe whether any members of the AGDF are providing service to dedicated CNG vehicles.

AGDF's Response: Please see attached.

19. Please explain or describe whether any members of the AGDF provide natural gas to existing CNG vehicle fueling stations.

AGDF's Response: Please see attached.

20. Please explain or describe whether any data exists comparing the efficiency of home fueling stations with dedicated / commercial-sized fueling stations.

AGDF's Response: Please see attached.

Propane Distribution System Conversion Program

21. **Please provide a recalculation of the recently provided G-RIM and Participants Tests for the Propane Distribution System Conversion Program, using the attached tables with the following considerations, in hardcopy and electronic (Excel) format.**

    a. **Give a G-RIM and Participants Test value for the conversion of each appliance, the replacement of each appliance, as well as a G-RIM value for the program as a whole.**

    b. **For fuel costs such as natural gas or propane, use most recent fuel price projections (with transportation costs at the escalation rate).**

    c. **At the end of the appliance's service life, assume the customer ceases use of the appliance and its fuel provider.**

    d. **For "Other Benefits" and "Other Costs," please break these into individual categories (such as administrative, consumer education, advertising, etc.) as necessary to outline the specific usage of these funds.**

    e. **For the customer charge and other expenses based upon % of total natural gas usage or similar ratio, assume that only the single appliance is converted or replaced and must pay the full cost.**

    f. **Exclude the cost of residential appliance warranties.**

AGDF's Response: Please see attached.

22. **What will be the rate impact of the Propane Distribution System Conversion Program, in cents per therm and dollars per average residential monthly bill?**

AGDF's Response: Please see attached.

23. **Please provide the annual cost estimates, in dollars and percent of total conservation expenses for the program and its components, including incentives, administrative, consumer education or marketing costs for the period 2009-2014.**

AGDF's Response: Please see attached.

24. **Please explain or describe whether there will there a cap to annual participation.**

AGDF's Response: Please see attached.

25. The petition states in paragraph 27 that AGDF has observed high participation rates in distributed propane services managed by FPUC and Chesapeake. The petition also states in paragraph 28 that "[o]ver the years there have been numerous Florida propane distribution systems that have lost significant numbers of customers to electricity conversions." Please reconcile these differences and provide discussion as to the reasons for the differences.

AGDF's Response: Please see attached.

26. What would the costs be in a conversion-only program for each appliance?

AGDF's Response: Please see attached.

27. Please identify the percentage of customers that use appliance warranties of the type described in the petition.

AGDF's Response: Please see attached.

28. How many members of the AGDF have constructed a Propane Distribution System in the past five years? As part of this response, please provide the number of customers annually in the past five years within these systems.

AGDF's Response: Please see attached.

29. How many members of the AGDF have purchased a Propane Distribution System in the past five years? As part of this response, please provide the number of customers annually in the past five years within these systems.

AGDF's Response: Please see attached.

30. How many members of the AGDF currently own or run a Propane Distribution System? Please provide the number of customers annually in the past five years within these systems.

AGDF's Response: Please see attached.

31. Please identify the number of conversions that have been conducted since 2000. As part of this response, please provide the number of customers converted annually since 2000.

AGDF's Response: Please see attached.

32. Please identify the number of Propane Distribution System Conversions that are anticipated in the next five years. As part of this response, please provide the number of customers to be converted annually.

AGDF's Response: Please see attached.

33. Please identify the number of Propane Distribution System purchases that are anticipated in the next five years. As part of this response, please provide the number of customers to be added annually.

AGDF's Response: Please see attached.

34. Please explain or describe the typical time between the construction of a Propane Distribution System and its conversion to natural gas for those systems constructed or purchased by members of AGDF.

AGDF's Response: Please see attached.

35. Please explain or describe the typical time between the construction of a Propane Distribution System and its conversion to natural gas for those systems planned to be constructed or purchased by members of AGDF within the next five years.

AGDF's Response: Please see attached.

36. Please complete the following table regarding the typical annual fuel usage of each appliance.

Appliance	Annual Fuel Usage by Type		
	Propane (Gal/yr)	Natural Gas (Therm/yr)	Electricity (kwh/yr)
Tankless Water Heating			
Storage Tank Water Heating			
Space Heating			
Clothes Drying			
Cooking			

AGDF's Response: Please see attached.

37. Please complete the following table regarding the typical annual fuel cost of each appliance.

Appliance	Annual Fuel Cost by Type		
	Propane ($)	Natural Gas ($)	Electricity ($)
Tankless Water Heating			
Storage Tank Water Heating			
Space Heating			
Clothes Drying			
Cooking			

AGDF's Response: Please see attached.

38. **Please complete the following table for historic & projected natural gas prices. Please provide a hardcopy and a copy in electronic (Excel) from.**

	Year	Natural Gas			
		Fuel Price	Escalation Rate	Transportation Price	Escalation Rate
		($/Therm)	(%)	($/Therm)	(%)
Historic Data	1999				
	2000				
	2001				
	2002				
	2003				
	2004				
	2005				
	2006				
	2007				
	2008				
Forecasted Data	2009				
	2010				
	2011				
	2012				
	2013				
	2014				
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	2016				
	2017				
	2018				
	2019				
	2020				
	2021				
	2022				
	2023				
	2024				
	2025				
	2026				
	2027				
	2028				

AGDF's Response: Please see attached.

39. Please complete the following table for historic & projected propane prices. Please provide a hardcopy and a copy in electronic (Excel) from.

	Year	Propane			
		Fuel Price ($/Gal)	Escalation Rate (%)	Transportation Price ($/Gal)	Escalation Rate (%)
Historic Data	1999				
	2000				
	2001				
	2002				
	2003				
	2004				
	2005				
	2006				
	2007				
	2008				
Forecasted Data	2009				
	2010				
	2011				
	2012				
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	2015				
	2016				
	2017				
	2018				
	2019				
	2020				
	2021				
	2022				
	2023				
	2024				
	2025				
	2026				
	2027				
	2028				

AGDF's Response: Please see attached.

Associated Gas Distributors of Florida
Responses to Staff's Data Requests
Docket No. 090122- EG

Conservation Demonstration & Development Program

1. What will be the rate impact of the Conservation Demonstration and Development Program in cents per therm and dollars per average residential monthly bill?

AGDF Response:

Attachment 1 to this document provides the data, calculations and results used to respond to this question.

The AGDF petition (paragraph 23) proposes a five (5)-year expenditure cap for each Local Distribution Company (LDC) under the CDD program. For the purposes of this response it is assumed that each respective AGDF member expends 1/5 of its five-year cap each year. While this expenditure level may be exceeded by some LDCs in a given year, AGDF members believe the assumption represents a realistic estimate of probable CDD annual costs. It should also be noted, that each LDC monitors its annual conservation expenditures and has some ability to limit discretionary expenditures, such as the proposed CDD costs. Nothing in this filing requires any LDC to provide a minimum level of funding for CDD projects.

The ECCR rate impacts were determined using the 2009 projected conservation expenses, therm usage and number of bills for the above listed rate classes for each LDC as approved in Docket No. 080004-GU. The incremental ECCR factor increase, which includes recovery of the proposed CDD program expenses, was calculated by increasing total conservation expenses on conservation Schedule C-1, page 1 of 1, and comparing the existing approved ECCR Factor with the recalculated ECCR Factor. The incremental increase in the ECCR Factor was multiplied by the annual number of therms for each residential class to produce the total incremental cost increase by class. The annual therms by class were divided by the number of bills for the class to produce an average therm quantity per bill. The average therm quantity was multiplied by the incremental increase in the ECCR Factor to produce the "Average Increase per Monthly Residential Bill" listed above.

2. Please provide annual cost estimates, in dollars and % of total conservation expenses for the program and its components, including incentives, administrative, consumer education or marketing costs, research, development, and demonstration costs for the period 2009 through 2014.

AGDF Response:

AGDF does not have a plan extending to 2014 that identifies specific research or demonstration projects. The proposed CDD program is intended to provide funding for such projects as the need or opportunity arises. The AGDF response to Question No. 10 provides a partial list of potential projects under consideration.

Over the past several years the gas industry has supported several research efforts related to tankless water heating, desiccant dehumidification, hydronic heating and commercial cooking. Each of these research activities has been used to develop conservation program initiatives, support building code modifications or assist in designing various conservation related consumer education programs. LDCs have expensed these costs. Over the same period, regulated Florida electric utilities have been able to recover several million dollars of electric research funding under Commission-approved electric conservation R&D programs. The gas industry is proposing to recover gas related research and demonstration costs in a similar manner.

Response No. 1, above indicated that a reasonable assumption of annual CDD expenditures would equal 1/5 of the proposed five-year cap for each LDC. The following chart indicates the percentage of proposed CDD expenses at the above annual expense assumption compared to the annual expenses projected for 2009 for each LDC.

	Five-Year Cap	Estimated Annual Exp.	% CDD Exp. to total EC Exp.*
Chesapeake Utilities	300,000	60,000	9.3%
Florida City Gas	500,000	100,000	3.1%
Florida Public Utilities	300,000	60,000	3.3%
Indiantown Gas	50,000	10,000	135.5%
Peoples Gas	750,000	150,000	3.7%
Sebring Gas	50,000	10,000	113.1%
St. Joe Natural Gas	50,000	10,000	8.0%

*Proposed estimated annual expenditure divided by the 2009 total conservation program expenses approved in Docket No. 080004-GU, Order No. PSC-08-0785-FOF-GU, for each respective LDC. It should be noted that it is unlikely that Indiantown and Sebring would commit to annual CDD costs at the above levels. Based on conversations with the companies, an annual CDD expense total would be in the $2,000 to $5,000 range.

3. Please explain or describe whether the members of the Associated Gas Distributors of Florida (AGDF) monitor their existing programs.

AGDF Response:

Each AGDF LDC administratively monitors its conservation programs to verify consumer appliance installations, ensure appropriate processing of allowance payments and otherwise manage the approved programs. AGDF members frequently assess the ECCR factor rate impact on consumers and may adjust discretionary program expenditures (such as advertising) to minimize the recovery surcharge. The annual projection filing to set the following year's ECCR factors also provides an opportunity for each LDC to assess program participation and costs.

In a recent conversation with staff, "program monitoring" was also defined to include the periodic recalculation of the cost effectiveness of each conservation program. Most AGDF members do not routinely recalculate the RIM and Participants Test cost-benefit ratios for each of their approved programs. However, in a series of filings beginning in late 2006 and continuing through 2007, all AGDF members received approval from the Commission to administer uniform residential conservation programs (the allowance amounts are the same for each LDC). As part of this process, the RIM and Participant Tests were produced using updated costs and revenues for each LDC. In developing the proposed Propane Distribution System Conversion Program the cost and revenue inputs into the RIM and Participants Tests were again updated for natural gas and developed for propane. AGDF has also recently updated the cost components required for the RIM and Participants Test assessments comparing natural gas to electricity. As noted in the AGDF petition, it is the intent of AGDF members to file, in the near future, a subsequent petition(s) that propose adjustments to the current residential programs.

AGDF members do not physically "monitor" (through instrumentation or sub-metering of appliances) residences participating in energy conservation programs to assess energy usage or other effects of consumer participation in the programs. However, since virtually all new customer additions and many appliance additions can be associated with a conservation allowance, LDCs do track customer and gas sales volumes related to conservation program participation. Based on this data it is possible to estimate the gas contribution to achievement of FEECA's electric demand and consumption objectives.

a. If the response is yes, how much are these costs?

AGDF Response:

LDCs do not maintain expense records that separate the "monitoring" costs from other administrative tasks. The costs for program "monitoring" are included in each LDCs conservation administration program costs. The total estimated administrative costs for 2009 are included in Order No. PSC-08-0785-FOF-GU, for each respective LDC.

b. Please explain or describe whether any costs are included in the cost-effective analysis of any program as an administrative or other cost.

AGDF Response:

The monitoring costs described above are included in the RIM Test for each program by appliance type. "Table 4" of the "RIM Test – Calculated Data" worksheet associated with each appliance type, as filed for each existing LDC program, includes a column entitled "Annual Admin. Costs". This costs represents the LDCs annual cost, allocated by appliance type, to administer the respective conservation program. The "monitoring" costs are included in this expense amount. Paragraph No. 45 of the AGDF petition provides additional information on the recovery of conservation administration costs and their inclusion in the cost-benefit model. The AGDF is including an example electronic copy of the RIM and Participants Test approved for Chesapeake Utilities in its 2006 Residential New Construction Program.

c. If the response is yes, please explain or describe how are these costs recovered.

AGDF Response:

These costs are recovered through the LDCs approved ECCR factors.

4. Please explain or describe whether the members of the AGDF conduct any form of annual or semi-annual review, to reflect changes in building codes, energy efficiency standards, or other changes.

AGDF Response:

Each AGDF member is also a member of the Florida Natural Gas Association (FNGA). FNGA has two standing committees that participate in code activities: the Building Code Committee and the Energy Code and Standards Committee. The Building Code Committee is primarily focused on the fuel gas, plumbing and mechanical codes. The Energy Code Committee has been heavily involved in energy code and energy standards activities in Florida since the initiation of the code in 1979. An FNGA member sits on the Florida Building Commission (FBC) Energy Technical Advisory Committee (ETAC). Another member is appointed to the Energy Code Workgroup, charged with advising the FBC on modifications to the 2010 Energy Code, including the adoption of the International Energy Conservation Code as a base code in Florida. The FNGA Energy Code committee has also been periodically engaged nationally in DOE appliance efficiency standards rulemakings and the development of other energy related standards and programs (such as Energy Star). The gas industry has worked closely with the FBC on the adoption of standards and compliance methodologies, most recently during the 2007 code

revision (effective March 2009) for gas tankless water heaters and hydronic heating systems.

a. If the response is yes, how much are these costs?

AGDF Response:

The FNGA retains a consultant to assist with Energy Code matters. The annual cost of the consultant is approximately $30,000. The principal LDC costs associated with energy related building code activities are related to the participation on the FNGA committee of various AGDF member employees. None of the AGDF LDCs specifically track the total employee hours invested in monitoring energy code issues. However, it is estimated that energy code related employee expenses would total less than $50,000 per year.

b. Please explain or describe how these costs are recovered.

AGDF Response:

To the extent that the compensation of some of the employees participating in the FNGA energy code committee is recovered through conservation, a portion of these costs would be recovered through the approved ECCR factors. It is estimated that less than $25,000 in employee building code related expenses are recovered through conservation. The remaining employee costs are expensed. The FNGA codes consultant cost is included in FNGA annual dues, and not recovered through energy conservation.

c. Please explain or describe whether any of these costs are included in the cost-effective analysis of any program as an administrative or other cost.

AGDF Response:

As noted above, the cost of certain AGDF employees may be recovered through conservation. These costs are included in the cost effective analysis of each conservation program as program administration costs and are described in the AGDF response to question No. 3. b., above.

d. If the response to 4 is no, please explain or describe how existing programs reflect changes in building codes or energy efficiency standards.

AGDF Response:

The efficiency standards for natural gas conservation programs were originally established (1980's) at the Energy Code minimum standard for water heaters and furnaces. When the National Appliance Energy Conservation Act (NAECA) was enacted in 1987, the federal government set

certain appliance efficiency standards at the point of manufacture. Covered appliances receiving rebates under the gas conservation programs all meet the federal minimum standards. At present there are no minimum efficiency standards adopted by NAECA or the Florida energy code for cooking or clothes drying appliances. The AGDF member programs require pilot-less ignition for these appliances.

5. Please explain or describe whether the members of the AGDF currently engage in literature searches, consumer behavior evaluations, market evaluations, and other activities to improve marketing.

AGDF Response:

On a limited basis, AGDF LDCs engage in some of the activities listed above. Most LDCs subscribe to industry journals, participate in industry training and indirectly fund (through membership fees) market studies conducted by the American Gas Association or other gas industry associations. Most LDCs participate in building industry trade associations and other groups that represent existing and potential customers (restaurant associations, for example). Some of the larger LDCs conduct periodic consumer surveys to assess, for example, reasons for consumer fuel switching or other behaviors. Some LDCs have subscribed to market research or market tracking services (primarily related to the homebuilding or construction industry) such as the Dodge Report, Florida Econocast, QuestLine, and America Metro Studies. AGDF members also participate in the Get Gas Florida advertising and consumer education program (described in paragraph 17 of the AGDF petition). The advertising agency that developed Get Gas Florida routinely conducts research into the most effective placement of ads and other conservation program promotional activities (trade show booths, etc.)

a. If the response is yes, how much are these costs?

AGDF Response:

Non-employee related expenses for these type activities are estimated at under $100,000 per year.

b. Please explain or describe whether any costs are included in the cost-effective analysis of any program as an administrative or other cost.

AGDF Response:

Some AGDF members recover a portion of the compensation for employees engaged in the above activities through energy conservation. Most of the Get Gas Florida costs are recovered through the respective LDC's conservation advertising programs. These costs are included in the cost effective analysis of each conservation program as program administration costs and are

described in the AGDF response to question No. 3. b., above. The consumer surveys and most of the market research subscriptions have historically not been recovered through conservation.

c. If the response is yes, please explain or describe how are these costs recovered.

AGDF Response:

See response to No. 5, b.

6. Please explain or describe whether the members of the AGDF engage in research into marketing, customer participation strategies, consumer education, appliance selection, fuel selection, or research related to these topics.

AGDF Response:

See response to No. 5.

a. If the response is yes, how much are these costs?

AGDF Response:

See response to No. 5.

b. Please explain whether any costs are included in the cost-effective analysis of any program as an administrative or other cost.

AGDF Response:

See response to No. 5.

c. If the response is yes, please explain or describe how are these costs recovered.

AGDF Response:

See response to No. 5.

7. Please refer to the Conservation Demonstration and Development Program's research into marketing, customer participation strategies, consumer education, appliance selection, fuel selection, or research related to these topics, please provide a listing of the anticipated use of funds for these topics. As part of this response, please describe each project.

AGDF Response:

AGDF has not identified a specific research project(s) related to the topics described above. The market research portion of the proposed CDD program was a relatively minor part of the research in which AGDF is interested. AGDF members are primarily interested in research related to gas appliances, equipment and installation techniques that would support i) modification of existing conservation program standards or allowances, ii) creation of conservation programs that include new technologies and iii) increased participation in the programs through the reduction of equipment or installation costs or improvements in consumer education activities. While AGDF is focused on "hard" technology based research, it is certainly conceivable that a market research project would be appropriate. In the AGDF response to Question 10, a U.S. DOE energy conservation project funding solicitation is discussed. Included in the DOE response guidelines for their evaluation of potential research projects, in addition to the technical approach of the proposed research, is a requirement to provide the marketing strategy that would, "...replicate the demonstrated application and significantly increase market share."

It should be noted that the proposed AGDF CDD program is intended to work in a manner similar to that of the current electric utility research programs. To our knowledge the electric programs have been historically approved by the Commission without definition of specific research projects. Each electric utility has a Commission-approved spending cap (most are annual – one has a five-year cap). In addition, there are limits on the amounts that can be expended for individual research projects within the total spending caps. The Commission exercises its usual audit review of the research projects and has the authority to disallow recovery of expenses deemed inappropriate.

Over the past few years, AGDF members have funded various research projects on tankless water heating, desiccant dehumidification, hydronic heating, commercial cooking, et.al. The research results helped the industry develop the tankless conservation program allowances currently approved by the Commission for all AGDF members. In addition, the current Energy Code tankless standards approved by the Florida Building Commission, along with the Modified Normalized Load Methodology for determining code compliance for appliances of various fuel types were developed through these research efforts. Virtually all of the funds committed to these projects were expensed by the LDCs. Our proposed CDD program would enable the gas industry to recover conservation related research costs under the same general program guidelines as the Commission has imposed on the electric industry.

a. Please explain or identify the specific metrics that will be used to assess the effectiveness of any funds used.

AGDF Response:

The metrics would be established at the time a specific project is initiated.

b. Please explain or describe whether the marketing expenses made with the Conservation Demonstration and Development Program will be used to promote any other conservation programs, or natural gas in general. As part of this response, please include any anticipated amounts.

AGDF Response:

AGDF has not contemplated utilizing CDD funds to market or promote any existing conservation program or natural gas in general. We could envision a circumstance where some expenses would be incurred to provide information to consumers participating in a demonstration or other research project, or perhaps publish the results of a study. The funds required for such activities would be minimal. AGDF members have existing authorization from the Commission to recover the costs of conservation related advertising and consumer education. We do not anticipate recovering such costs through the CDD program.

8. Please explain or describe whether the marketing expenses made with the Conservation Demonstration and Development Program will be used to promote any other conservation programs, or natural gas in general. As part of this response, please include any anticipated amounts.

AGDF Response:

Other than the limited expenses described in response No. 7, AGDF has no intent to incur CDD project costs to promote any conservation program or natural gas in general.

9. The petition describes in paragraph 18 that funds will be used to investigate consumer and homebuilder fuel type decision making. Please identify how much of these funds will focus on natural gas conservation.

AGDF Response:

Any funds used to support a research project of this type would be exclusively focused on increasing participation in existing conservation programs, the modification of an existing program or in the development of new programs.

10. In paragraph 18 of the petition, it states that research will be devoted to creating more effective incentive programs. Please explain or describe how this would be accomplished. Please identify the amount of funds that would be dedicated to creating more effective incentive programs.

AGDF Response:

No specific projects or funding amounts have been identified. However, AGDF could envision several potential projects that would be helpful in designing conservation programs that increase efficiency or consumer participation:

- The current Residential Appliance Retention Program provides allowances to consumers to retain gas appliances at the time appliances are replaced. In spite of these allowances, several thousand consumers each year convert from natural gas to electricity. These conversions are counter to FEECA objectives since they add to electric demand and consumption. A study to identify the reasons for such conversions and measures to increase retention would be useful.

- AGDF LDCs currently include high efficiency gas tankless water heating units in each of the primary residential conservation program (new construction, appliance replacement and appliance retention). Virtually all of the units installed involve a single, central unit that serves the entire hot water demand for the home. A research project that investigated the operating, economic and energy saving results from the installation of multiple smaller volume tankless units could improve our existing programs.

- A study of ductless whole house heating systems to replace electric heating and central gas furnaces could improve the existing space heating allowance programs.

- An analysis of consumer participation levels under various program designs could increase conservation levels. For example, several current commercial gas conservation programs provide allowances based on a $/kw displaced as opposed to an allowance amount per appliance. It is not known which method works best, or whether other incentives would produce greater results.

- Attachment 2 to this document is a Funding Opportunity Announcement from the US Department of Energy indicating several research topics for which federal funding is available. The Florida gas industry is working with the Florida Solar Energy Center to identify gas-related research projects that meet the DOE criteria and provide useful data for Florida LDCs. The DOE projects typically require a 20% to 50% cost share from the applicant. There are several projects listed in the DOE announcement especially under Areas of Interest 4, 5 and 6 that, AGDF is interested in supporting. Under the CDD program, AGDF would contract with FSEC or other research entities to prepare the DOE funding request and complete the project. AGDF funds would be used to meet the DOE shared cost requirement. Results from the projects would be used to add technologies or products, establish new efficiency or installation requirements for existing conservation programs, or develop new programs.

11. In paragraph 18 of the petition, it states that research will be devoted to creating more effective consumer education programs. Please explain or describe how this would be accomplished. Please identify the amount of funds that would be dedicated to creating more effective consumer education programs.

AGDF Response:

To the extent that the CDD research projects identified products, technologies, installation techniques or operational practices that support enhanced conservation activities, such information would be incorporated into the gas industry's consumer education programs. It is conceivable that CDD funds could be used to identify consumer behavior related to the purchase and/or operation of various appliances or energy consuming equipment. Such information would be useful in designing conservation program related advertising messages targeted to increase program participation or improve consumer conservation actions.

12. Please explain or identify the demographics or targeted audience (residential, commercial, industrial, income brackets, etc.) of the proposed research. Also, please explain or describe whether the focus will be upon natural gas appliance users or electric appliance users.

AGDF Response:

There is no specific research project proposed.

13. Please explain or describe whether any existing programs from AGDF's members allow a ratepayer to qualify for a rebate or other incentive for installation of a gas tankless water heating system.

AGDF Response:

Each AGDF member administers a Commission approved Residential New Construction Program, Residential Appliance Replacement Program and Residential Appliance Retention Program. Each of these programs includes an allowance for the installation of a gas tankless water heating system. Some AGDF members administer non-residential conservation programs that would also provide an allowance for gas tankless installations.

a. Please explain or describe whether a ratepayer could qualify under any of these programs if the gas tankless water heating system was installed as a backup to or in conjunction with a solar thermal water heating system.

AGDF Response:

In AGDF's view, consumer's installing a solar/gas tankless systems would qualify for a conservation allowance.

b. If ratepayers do not qualify for incentives or rebates, could the utility modify any existing programs to allow incentives for these combinations?

AGDF Response:

14. Please explain or describe why AGDF is seeking approval of Solar Thermal / Gas Tankless water heating systems as a component of the Conservation Demonstration and Development Program instead of as a pilot program.

AGDF Response:

AGDF has been investigating the installation of thermal solar/gas combination water heating systems for the past two years. The proposed CDD program would be available to continue the research on these combination systems. The research could be designed to, for example, test the overall operational efficiency of the combination units or identify installation techniques that would lower the overall unit cost. In addition, several AGDF members are interested in installing the combination systems on a limited basis to demonstrate their operating characteristics, maintenance requirements and the economics of purchasing and operating the system. AGDF believes that small scale demonstration projects, especially in commercial and multi-family applications, is appropriate prior to a broader scale pilot program. At this point we need to develop a greater understanding of the risks and benefits associated with combination systems, both for the utilities and their consumers. It is also not clear what level of incentive or program structure may be required to best promote and administer the installation of combination solar/gas water heating appliances.

a. Please explain or describe how pilot programs would differ from the demonstration projects proposed in this petition.

AGDF Response:

A demonstration project would include the installation of, in this example, a solar/gas tankless water heating system in a relatively controlled environment as part of an on-going research program. The demonstration project would likely include instrumentation and monitoring to gather data on the performance of the unit. The intent is to demonstrate that the units perform acceptably under something close to real world conditions, yet in a controlled environment with reasonable access to the appliance or product under investigation. As an example, the FNGA is currently working on a demonstration project to install a combination water heating system at the

Florida Governor's mansion. FNGA has contracted with FSEC to install operational monitoring equipment and design the combination system. The data and lessons learned from this project will be helpful in designing or modifying AGDF conservation programs. In our view, several demonstration projects targeting different building types would be useful in designing larger scale combination water heater programs. A pilot program, in our view, would offer the combination units to a larger universe of participants, and may or may not include some physical performance monitoring. Larger scope pilot projects are useful in determining consumer acceptance, administrative requirements, installation problems and operating issues in a larger population prior to a full roll-out.

b. Please explain or describe the type of information being gathered in these demonstrations.

AGDF Response:

The demonstration projects would be instrumented and monitored to produce the data required to evaluate the systems. We would anticipate that each project would be designed and managed by an outside third party (university research group such as FSEC).

c. The petition states in paragraph 18 that such systems are 'highly efficient.' Please explain or describe any previous research or development done for Solar thermal / gas backup water heaters.

AGDF Response:

The Energy Factor (EF) efficiency ratings of gas tankless water heaters are tested in accordance with the US Department of Energy test procedures for gas instantaneous water heaters as provided in 10 CFR 430, Subpart B. Most of the tankless water heater manufacturers are voluntarily complying with the Federal Trade Commission's Appliance Labeling Rule (16 CFR, Part 305), which provides a straightforward method for homebuilders, code officials and consumers to identify EF ratings. Most tankless manufactures also participate in the Gas Appliance Manufacturers Association (GAMA) appliance testing and certification program. GAMA contracts with an independent laboratory to test water heaters using the DOE test procedures. Virtually all of the tankless units tested are rated at above .80 EF. Thermal solar systems installed in Florida are required to be tested and the solar fraction rated by FSEC. Individually, both of these systems receive compliance credit in the Florida Energy Code that is significantly greater than a standard electric or gas storage water heater.

In 2008, the FNGA funded a research project on solar/gas tankless water heaters conducted by the Florida Solar Energy Center. The study was

intended to investigate the feasibility of such installations in Florida. FSEC is currently engaged in a DOE Build America research project that involves physical testing of several water heater types including a thermal solar/gas tankless unit. We are unaware of any other research on these combination systems in Florida.

The following questions address compressed natural gas (CNG) vehicles.

15. Please explain or describe whether any members of the AGDF have any previous experience with CNG vehicles.

AGDF Response:

During the late 1980's up to 1997, Florida City Gas (FCG) operated approximately 20 company vehicles on CNG. Refueling stations were constructed by FCG at its Hialeah and Brevard County operations centers. In addition, FCG provided gas service (and was involved in the installation) of CNG stations that served Miami Airport and Miami-Dade Transit vehicles. TECO Peoples Gas operated approximately 150 CNG vehicles until 2000. Peoples Gas provided natural gas service to 31 CNG stations across the state at its peak in 1997.

16. Please explain or describe whether any members of the AGDF have any special rates or other programs relating to CNG vehicles.

AGDF Response:

Florida City Gas and TECO Peoples Gas have Commission approved tariff compressed natural gas vehicle rates.

17. Please explain or describe whether any members of the AGDF are investigating conversion of existing conventional vehicles.

AGDF Response:

Over the past two years, AGDF members have worked with the Governor's office and legislature on various transportation fuel conservation initiatives. In conjunction with this process, Florida City Gas is investigating converting company vehicles to natural gas. TECO Peoples Gas is converting some of its fleet to natural gas. In addition, Peoples Gas has recently purchased four dedicated natural gas Honda Civics.

18. Please explain or describe whether any members of the AGDF are providing service to dedicated CNG vehicles.

AGDF Response:

TECO Peoples Gas is currently providing gas service to five customers with CNG fueling stations and dedicated natural gas vehicles. In addition, two new Peoples Gas customers, the Hillsborough County Environmental Protection Commission and Choice Environmental Services have recently announced that they will be utilizing dedicated CNG vehicles, including 15 refuse collection trucks.

19. Please explain or describe whether any members of the AGDF provide natural gas to existing CNG vehicle fueling stations.

AGDF Response:

TECO Peoples Gas is providing service to five customers who have existing CNG fueling stations. In addition TECO has seven existing company-owned CNG stations in its operating divisions.

20. Please explain or describe whether any data exists comparing the efficiency of home fueling stations with dedicated / commercial-sized fueling stations.

AGDF Response:

No known data exists comparing the efficiency of home fueling equipment to dedicated commercial stations.

Associated Gas Distributors of Florida
Attachment 1 to Staff Data Request
Residential Customer Rate Impact of Proposed CDD Program
Docket No. 090122-EG

LDC	Current ECCR Factor	ECCR Factor w/CDD Expenses	Incremental ECCR Factor	Annual Therms	Incremental Cost	Number Bills	Average Therms Per Bill	Avg. Increase RES $/Bill
Chesapeake								
FTS-A	$0.11835	$0.12930	$0.01095	288,100	$3,155	37,836	7.6	$0.08
FTS-B	$0.09247	$0.10103	$0.00856	365,541	$3,129	27,192	13.4	$0.12
FTS-1	$0.08372	$0.09147	$0.00775	1,616,274	$12,526	86,212	18.7	$0.15
FTS-2	$0.04271	$0.04666	$0.00395	1,614,605	$6,378	19,930	81.0	$0.32
Florida City Gas								
GS1, GS-100, GS-220	$0.09304	$0.09595	$0.00291	17,655,755	$51,378	1,147,176	15.4	$0.04
Florida Public Utilities	$0.06768	$0.06990	$0.00222	12,143,150	$26,958	570,435	21.3	$0.05
Indiantown Gas	$0.01339	$0.03149	$0.01810	150,000	$2,715	8,760	17.1	$0.31
Peoples Gas	$0.02438	$0.02531	$0.00093	73,225,315	$68,319	3,701,369	19.8	$0.02
Sebring Gas	$0.03076	$0.06556	$0.03480	38,712	$1,347	4,059	9.5	$0.33
St. Joe Natural Gas								
RS-1	$0.23390	$0.25250	$0.01860	85,912	$1,598	12,736	6.7	$0.13
RS-2	$0.11902	$0.12852	$0.00950	229,005	$2,176	11,055	20.7	$0.20
RS-3	$0.08797	$0.09497	$0.00700	413,540	$2,895	10,056	41.1	$0.29

FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT

U. S. Department of Energy

National Energy Technology Laboratory

"Recovery Act: Advanced Energy Efficient Building Technologies"

Funding Opportunity Number: DE-FOA-0000115

Announcement Type: Initial

CFDA Number: 81.086 Conservation Research and Development

Issue Date:	**06/29/2009**
Letter of Intent Due Date:	**Not Applicable**
Pre-Application Due Date:	**Not Applicable**
Application Due Date:	**08/18/2009 at 8:00:00 PM Eastern Time**

This Announcement will remain open until the Application Due Date indicated above however, applications may be submitted any time before this Announcement closes.

It is also recommended that application submission begin well in advance (at least 48 hours) of the Announcement closing.

NOTE: REGISTRATION/SUBMISSION REQUIREMENTS

Registration Requirements

There are several one-time actions you must complete in order to submit an application in response to this Announcement (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the Central Contractor Registration (CCR), and register with FedConnect). Applicants, who are not registered with CCR and FedConnect, should allow at least 10 days to complete these requirements. It is suggested that the process be started as soon as possible.

Applicants must obtain a DUNS number. DUNS website: http://fedgov.dnb.com/webform.

Applicants must register with the CCR. CCR website: http://www.ccr.gov/

Applicants must register with FedConnect to submit their application. FedConnect website: www.fedconnect.net

Questions

Questions relating to the **system requirements or how an application form works** must be directed to Grants.gov at 1-800-518-4726 or **support@grants.gov**.

Questions regarding the **content** of the announcement must be submitted through the FedConnect portal. You must register with FedConnect to respond as an interested party to submit questions, and to view responses to questions. It is recommended that you register as soon after release of the FOA as possible to have the benefit of all responses. More information is available at **http://www.compusearch.com/products/fedconnect/fedconnect.asp**. DOE/NNSA will try to respond to a question within 3 business days, unless a similar question and answer have already been posted on the website.

Questions pertaining to the **submission** of applications through FedConnect should be directed by e-mail to support@FedConnect.net or by phone to FedConnect Support at 800-899-6665.

Application Preparation and Submission

Applicants must download the application package, application forms and instructions, from Grants.gov. Grants.gov website: http://www.grants.gov/

(Additional instructions are provided in Section IV A of this FOA.)

Applicants must submit their application through the FedConnect portal. FedConnect website: www.fedconnect.net

(Additional instructions are provided in Section IV H of this FOA.)

Applicants must apply to one of the specific Technical Subtopics (1.1, 1.2, 1.3, 1.4, 2.1, 2.2, 2.3, 3.1, 3.2, 3.3, 3.4, 4.1, 4.2, 4.3, 5.1, 5.2, 5.3, 5.4, 6.1 or 6.2) identified under each Area of Interest. The required format for the title will be: "Technical Subtopic [1.1 or 1.2 or 1.3, etc.] (Project Title)" See Section IV, C. 1 and 2.

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SECTION I - FUNDING OPPORTUNITY DESCRIPTION

AMERICAN RECOVERY AND REINVESTMENT ACT OF 2009 (ARRA 2009)

Projects under this Funding Opportunity Announcement (FOA) will be funded, in whole or in part, with funds appropriated by the American Recovery and Reinvestment Act of 2009, Pub. L. 111-5, (Recovery Act or Act). The Recovery Act's purposes are to stimulate the economy and to create and retain jobs. The Act gives preference to activities that can be started and completed expeditiously. Accordingly, special consideration will be given to projects that promote and enhance the objectives of the Act, especially job creation, preservation and economic recovery, in an expeditious manner.

Be advised that special terms and conditions may apply to projects funded by the Act relating to:

- Reporting, tracking and segregation of incurred costs;
- Reporting on job creation and preservation;
- Publication of information on the Internet;
- Access to records by Inspectors General and the Government Accountability Office;
- Prohibition on use of funds for gambling establishments, aquariums, zoos, golf courses or swimming pools;
- Ensuring that iron, steel and manufactured goods are produced in the United States;
- Ensuring wage rates are comparable to those prevailing on projects of a similar character;
- Protecting whistleblowers and requiring prompt referral of evidence of a false claim to an appropriate inspector general; and
- Certification and Registration.

These special terms and conditions will be based on provisions included in Titles XV and XVI of the Act. The special terms and conditions can be found at http://management.energy.gov/policy_guidance/1672.htm.

The Office of Management and Budget (OMB) has issued Implementing Guidance for the Recovery Act. See M-09-10, Initial Implementing Guidance for the American Recovery and Reinvestment Act of 2009 and M-09-15, Updated Implementing Guidance for the American Recovery and Reinvestment Act of 2009. OMB will be issuing additional guidance concerning the Act in the near future. Applicants should consult the DOE website, www.energy.gov, the OMB website http://www.whitehouse.gov/omb/, and the Recovery website, www.recovery.gov regularly to keep abreast of guidance and information as it evolves.

Recipients of funding appropriated by the Act shall comply with requirements of applicable Federal, State, and local laws, regulations, DOE policy and guidance, and instructions in this FOA, unless relief has been granted by DOE. Recipients shall flow down the requirements of applicable Federal, State and local laws, regulations DOE policy and guidance, and instructions in this FOA to subrecipients at any tier to the extent necessary to ensure the recipient's compliance with the requirements.

Be advised that Recovery Act funds can be used in conjunction with other funding as necessary to complete projects, but tracking and reporting must be separate to meet the reporting requirements of the Recovery Act and related OMB Guidance. Applicants for projects funded by sources other than the Recovery Act should plan to keep separate records for Recovery Act funds and to ensure those records comply with the requirements of the Act. Funding provided through the Recovery Act that is supplemental to an existing grant is one-time funding.

Applicants should require their first tier subawardees to obtain a DUNS number (or update the existing DUNS record) and register with the Central Contractor Registration (CCR).

A. FUNDING OPPORTUNITY ANNOUNCEMENT OBJECTIVES

The Department of Energy (DOE), National Energy Technology Laboratory (NETL), on behalf of the Office of Energy Efficiency and Renewable Energy's (EERE) Building Technologies Program (BTP), is seeking applications under six broad Areas of Interest. Each Area of Interest includes several specific Technical Subtopics (which are described in further detail throughout this section) as follows:

Area of Interest 1: Advanced Building Control Strategies, Communications and Information Technologies for Net-Zero Energy Buildings

Technical Subtopic 1.1:	Advanced Building Control Strategies and Interfaces
Technical Subtopic 1.2:	Advanced Whole-Building Control Systems and Information Technology
Technical Subtopic 1.3:	Advanced Component Level Software and Hardware Development
Technical Subtopic 1.4:	Energy Control and Optimization Algorithms and Tools

Area of Interest 2: Analysis, Design and Technical Tools

Technical Subtopic 2.1:	Systems Engineering Tools for Very-Low Energy Buildings
Technical Subtopic 2.2:	Scientific and Engineering Foundations for Designing and Operating Very-Low Energy Buildings
Technical Subtopic 2.3:	Miscellaneous Electric Load (MEL) Prediction and Modeling

Area of Interest 3: Building Envelope and Windows

Technical Subtopic 3.1:	Window and Daylighting Technology Development
Technical Subtopic 3.2:	Envelope Technology Development
Technical Subtopic 3.3:	Building Envelope and Window Case Studies and Demonstrations
Technical Subtopic 3.4:	Production Engineering for R5 and Higher Windows

Area of Interest 4: Residential and Commercial HVAC and Crosscutting Air Conditioning and Refrigeration Research

Technical Subtopic 4.1:	Residential HVAC
Technical Subtopic 4.2:	Commercial HVAC
Technical Subtopic 4.3:	Crosscutting Air Conditioning and Refrigeration Research

Area of Interest 5: Water Heating, Residential and Commercial Appliances and MELs

Technical Subtopic 5.1:	Water Heating
Technical Subtopic 5.2:	Residential Appliances
Technical Subtopic 5.3:	Commercial Appliances
Technical Subtopic 5.4:	Miscellaneous Electric Load Reduction

Area of Interest 6: Solar Heating and Cooling (SHC)

Technical Subtopic 6.1:	Residential SHC R&D
Technical Subtopic 6.2:	Commercial SHC R&D

DOE estimates that approximately $25-$75 million shall be available for awards under this Funding Opportunity Announcement (FOA). DOE will seek at least 20-50 percent applicant cost share with performance periods between 1 to 3 years. Applications with a minimum of 20% cost share (except as noted in Section III – Eligibility Information, Part B - Cost Share) are sought for all Technical Subtopics EXCEPT for Technical Subtopics 3.3 and 3.4. Applications with a minimum of 50% cost share (except as noted in Section III – Eligibility Information, Part B - Cost Share.) are sought for Technical Subtopics 3.3

and 3.4 Awards with durations more than 12 months shall include continuation decision points and may be partially funded in future fiscal years, dependent upon availability of funds.

B. BACKGROUND INFORMATION

This FOA is authorized by Public Law (PL) 95-91 DOE Organization Act as amended by PL 109-58 Energy Policy Act 2005. This FOA is in response to the Department of Energy's American Recovery and Reinvestment Act (ARRA) of 2009 (Pub. L. No. 111-5, Title IV) priorities and goals for:

1. Science and Discovery: Invest in science to achieve transformational discoveries;
2. Clean, Secure Energy: Change the landscape of energy demand and supply;
3. Economic Prosperity: Create millions of green jobs and increase competitiveness;
4. National Security and Legacy: Maintain nuclear deterrent and prevent proliferation; and
5. Climate Change: Position U.S. to lead on climate change policy, technology, and science.

The Advanced Building Technologies FOA directly supports four of the five DOE ARRA funding priorities and goals. The Science and Discovery goal will be met by developing innovative technologies and energy efficiency systems for both new and existing residential and commercial buildings and by making breakthrough concepts market-ready through research, development and deployment. The second and fifth DOE ARRA priorities, Clean, Secure Energy and Climate Change, will be met through decreased energy use, resulting in fewer greenhouse gas emissions and less energy imports, and by increasing the energy efficiency of homes and commercial buildings. The third DOE ARRA priority, Economic Prosperity, will be addressed by positioning the U.S. as a leader in building energy efficient technologies, establishing a "green" workforce and technical expertise and deploying technologies that reduce the energy cost burden on homeowners and building operators.

In addition to the DOE ARRA funding goals, the advanced building technologies and deployment mechanisms supported by this FOA will accelerate Building Technology Program (BTP) research goals towards achieving net-zero energy homes and buildings through an increased focus on systems design, integration and controls. This FOA will also enable the DOE BTP to initiate an aggressive effort to target existing residential and commercial buildings for energy efficiency enhancements, a largely unaddressed opportunity for immediate energy savings. Advanced research and development (R&D) Areas of Interest addressed in this FOA are: 1) Advanced Building Controls, Communications and Information Technologies for Net-Zero Energy Buildings; 2) Analysis, Design and Technical Tools; 3) Building Envelope and Windows; 4) Residential and Commercial Heating, Ventilation and Air Conditioning (HVAC) and Crosscutting Air Conditioning and Refrigeration Research; 5) Water Heating, Residential and Commercial Appliances and Miscellaneous Electric Loads (MELs); and 6) Solar Heating and Cooling (SHC).

Projects funded through these Areas of Interest will accelerate and enable concurrent DOE BTP R&D on multiple advanced building technologies with levels of maturity ranging from applied research and analysis through engineering/prototype development and field testing and demonstration. New energy efficient building technologies will enter the market sooner and the cost of the best available technologies will be reduced for both new and existing buildings as a result. These projects will also accelerate the development and availability of high-risk/high-payoff energy efficient building technologies that would not occur without industry/government partnerships. By advancing the activity and focus of DOE BTP R&D, these projects will accelerate technical progress towards, and reduce the risk of achieving target timeframes for, widespread availability of net-zero energy homes and buildings.

C. PROGRAM AREAS OF INTEREST

Each application shall address a specific Technical Subtopic within a particular Area of Interest. **If you wish to submit an application for more than one Technical Subtopic, then separate applications are required. NOTE: An application which contains more than a single Technical Subtopic will be considered non-responsive.**

The specific Areas of Interest and their associated Technical Subtopics that are being sought through this FOA are:

Area of Interest 1: Advanced Building Control Strategies, Communications and Information Technologies for Net-Zero Energy Buildings

The goal of the DOE BTP is to achieve market ready net-zero energy residential buildings by 2020 and net-zero energy commercial buildings by 2025. Buildings need to be designed, built, operated, and maintained as an integrated system to achieve more energy efficient, and eventually, net-zero energy buildings. Just as automobiles rely on sensors and controls to optimize performance, fuel economy, and safety, buildings too can be built, operated and ultimately controlled to improve comfort, safety, and energy efficiency. As homes and commercial buildings approach net-zero energy performance capability, advanced whole-building controls, communications and information technologies will be needed to ensure that these buildings operate to their full potential. Although some building sub-systems (e.g., lighting and HVAC) currently employ sensors and controls, there is a lack of strategies to integrate and extend sensors and controls across the entire building's systems and operations.

Area of Interest 1 seeks to support the development of advanced building control strategies, communications, and information technologies to transform the design, operation and maintenance of both new and existing buildings. Proposed technologies must be economically justified from a lifecycle cost analysis, durable, reliable, demonstrate a credible pathway to energy savings in a variety of building types and operational modes, and be easily integrated into residential and/or commercial buildings.

High performance buildings will require reliable and standardized communications, information technology infrastructure and protocols at both the component and control level. Controls need to be integrated through computerized building management systems that optimize energy use and interface with renewable systems and the grid. Advanced controls should be able to diagnose and correct problems without user intervention, pinpoint operational issues, suggest corrective actions, and potentially dispatch repair technicians. Fault detection and diagnostics will ensure that net-zero energy buildings have the potential to perform as designed over time, and adapt to changes in configuration and use over the life of the building. Whole-building advanced control systems, linked to building information models, will enable subsystem optimization to achieve designed energy and environmental performance intent, increase occupant comfort and productivity, and identify and address operational issues as they arise. A fully integrated building will control lighting, heating, cooling, and ventilation needs based on occupancy, activity and external conditions. Area of Interest 1 requests applications for projects in response to the following 4 Technical Subtopics:

Technical Subtopic 1.1: Advanced Building Control Strategies and Interfaces (This Technical Subtopic seeks 20% cost share.)

Projects are requested for new concepts or ideas for building communications protocols, automated logic control systems and sensor networks that can provide energy savings in a variety of building types and operational modes.

Technical Subtopic 1.2: Advanced Whole-Building Control Systems and Information Technology (This Technical Subtopic seeks 20% cost share.)

Projects are requested for new concepts and ideas for development of integrated whole-building controls and information technologies for new construction and retrofits of existing buildings to: detect and repair, or alert users as to pending problems; manage and control low-energy buildings; maximize energy storage utilization strategies; maximize energy savings and peak demand reductions; integrate on-site generation and renewable energy sources, and enable two-way communication with the electrical grid (Smart Grid http://www.oe.energy.gov/smartgrid.htm). These advanced whole-buildings control systems should be capable of automatically detecting and configuring building subsystems and equipment, components and sensors that have conforming "plug and play" capabilities.

Technical Subtopic 1.3: Advanced Component Level Software and Hardware Development (This Technical Subtopic seeks 20% cost share.)

Projects are requested that will lead to "plug and play" capability for building components and equipment. "Plug and play" capability will enable individual components and equipment to interact with integrated whole-building control system capabilities to: detect and repair, or alert users as to pending problems; manage and control low-energy buildings; maximize energy storage utilization strategies; maximize energy savings and peak demand reductions; integrate on-site generation and renewable energy sources; and enable two-way communication with the electrical grid (Smart Grid).

Technical Subtopic 1.4: Energy Control and Optimization Algorithms and Tools (This Technical Subtopic seeks 20% cost share.)

Projects are requested for new concepts or ideas or to develop integrated modeling and predictive control technologies for whole-building control information technology (IT) software and hardware technologies to: estimate occupancy; manage system component energy usage; reduce peak energy demand; manage active and passive thermal storage systems; maintain energy storage utilization and potential as a function of building type and climate zone; and control building critical thermodynamic states and systems power consumption.

Area of Interest 2: Analysis, Design and Technical Tools

Area of Interest 2 seeks to improve the capability and availability of analysis, design and technical tools for both residential and commercial buildings. Analysis, design and technical tools enable optimal use of advanced building technologies, materials and controls in both new and existing buildings. Building energy performance, particularly in net-zero energy buildings, is the result of complex interactions between many elements, including climate, envelope heat and moisture transfer, internal heat gains, lighting power, HVAC equipment, controls, thermal and visual comfort, and energy cost. These interactions cannot be adequately understood and quantified without simulation tools.

Increasingly powerful simulation tools are required to evaluate new net-zero energy building demand-reduction and energy-supply technologies and support technology implementation and control decisions throughout the life cycle of building design through operation. The development of design and operation tools to optimize the interactions of advanced building technologies and ensure that they are installed and operated effectively is critical to building operations. Projects should consider compatibility with other building design and energy simulation tools to facilitate their deployment. Concepts applicable to both new construction and building retrofits are of particularly interest. It is also vital to consider designers of high volume, high visibility, and large buildings to demonstrate the value and support the deployment of building simulation tools in the market. Area of Interest 2 requests applications for projects in response to the following 3 Technical Subtopics:

Technical Subtopic 2.1: Systems Engineering Tools for Very-Low Energy Buildings (This Technical Subtopic seeks 20% cost share.)

Projects are requested for analysis, design and technical tools to: incorporate advanced building technologies into whole building optimization and simulation; establish accurate test and verification procedures for technology validation and commercialization; measure and compare building performance to baseline simulations, benchmarking and historical data; model multivariate predictive controls for optimization of dynamic system elements; integrate and model active and passive systems; design and integrate building energy storage systems; and improve simulation visualization capabilities.

Technical Subtopic 2.2: Scientific and Engineering Foundations for Designing and Operating Very-Low Energy Buildings (This Technical Subtopic seeks 20% cost share.)

Because designing and operating very-low energy buildings is not entirely intuitive, projects are requested to develop the scientific and engineering foundations of integrated systems that consider all the energy-related impacts and interactions of building components, including the building site, the building envelope (walls, windows, doors, and roof), heating, ventilation, and air-conditioning systems; and lighting, controls, and equipment. Scientific and engineering practices are anticipated to vary by climate zones.

Technical Subtopic 2.3: Miscellaneous Electric Load (MEL) Prediction and Modeling (This Technical Subtopic seeks 20% cost share.)

Projects are requested for tools to estimate and model miscellaneous electric loads. MELs are small individually but can have a significant impact on total building energy use due to large aggregate loads. MEL electricity impacts can include several modes of operation and energy consumption, e.g., a low-power (e.g. standby) and active modes. A consistent approach for predicting and modeling MEL energy use while considering systems interactions are needed to reduce total energy use in buildings.

Area of Interest 3: Building Envelope and Windows

Area of Interest 3 seeks to improve the energy efficiency of residential and commercial building windows and envelope components. Residential and commercial buildings are the are the largest energy consuming sector, accounting for about 40 percent of total U.S. annual energy use (39.7 quadrillion British Thermal Units (Btu's) of energy (quads)). Residential buildings consume 22 percent and commercial buildings 18 percent of the building sector total. A building's envelope (roofs, walls, and foundations) and windows typically account for 36 percent of overall energy use, or about 14.3 quads in residential and commercial buildings combined, at an annual cost of $133 Billion. When the impacts of using advanced strategies such as natural daylighting on building ventilation and lighting is considered, building envelope and windows can actually impact 51 percent of the building energy loads. Improving envelope and windows performance will greatly contribute to the DOE BTP net-zero energy buildings goals by significantly reducing space heating and cooling energy losses.

Envelope and windows technology projects are generally component based. While DOE fully embraces a whole-house or building application, the DOE BTP integration team activities are focused on system based approaches. Whole-house or building case studies are applicable to this area of interest, but the intent is to promote improvements to a specific or group of envelope components. While developing whole-building controls and systems will help optimize component behavior, advances in the components themselves are necessary to achieve significant energy savings and performance enhancements in buildings. Projects can be residential or commercial, and applicable to both the new and retrofit markets. Technologies that have broad application across climate regions will be considered the most promising. Area of Interest 3 requests applications for projects in response to the following 4 Technical Subtopics:

Technical Subtopic 3.1: Window and Daylighting Technology Development (This Technical Subtopic seeks 20% cost share.)

Projects are requested to produce fundamental window and daylighting technology improvements for net-zero energy homes and buildings. Key DOE BTP project priorities are improved energy performance and cost and durability issues and barriers. Additional details on goals for high-performance windows and daylighting can be found in the BTP Multi-Year Program Plan at http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/myp08complete.pdf. Technologies of particular interest under this technical subtopic include:

- Highly insulated windows with an overall heat transfer coefficient (U-Value) of 0.10 (or thermal resistance, R, of 10) at a consumer price premium of $5 per square foot above standard double pane low-e products in the near term and $3 per square foot in the 2020 timeframe. A key technical obstacle to highly insulated windows is that as performance improves and thermal resistance approaches R10, the solar heat gain coefficient (SHGC) is significantly reduced due to multiple glazing layers. Thus, higher solar heat gain while achieving R10 performance is a key objective for net-zero energy building windows for northern climates, making vacuum glazing of particular interest. However, the DOE BTP is open to any innovative technology that solves the SHGC problem. While R10 is a primary goal, windows that offer high cost/benefit ratios that are R7 or higher are also of interest, especially for mixed climate applications.

- Dynamic windows that provide a large SHGC range from 0.09 to 0.53 or higher at a consumer price premium of $20 per square foot above standard insulated glass units in the near term and $5 per square foot in the 2020 timeframe. Dynamic windows need to approach a price premium of approximately $5 per square foot to be market viable. Therefore, fundamental new coating technologies that offer dramatic production cost reductions are a key DOE BTP focus. The ultimate dynamic window would be one that can control visible and near infrared light independently, thus allowing full control of energy flows and daylighting. Passive devices are also of interest. However, a passive window's consumer price premium must be lower due to lower expected energy savings and lack of energy control to be viable.

- Daylighting systems that can harvest visible light while rejecting near infrared. A key envelope technology need is daylighting systems that are easy to install and maintain. While dynamic glazing will improve daylighting possibilities for spaces near windows, the DOE BTP is interested in harvesting daylight deeper into the core of buildings. The long term DOE BTP daylighting goal is to reduce lighting energy use by 60 percent at a depth of at least 30 feet from the exterior wall at a price premium of $6 per square foot of window area.

Technical Subtopic 3.2: Envelope Technology Development
(This Technical Subtopic seeks 20% cost share.)

Building envelopes are constructed using a variety of building materials, including insulation, membranes, sealants, and a large array of structural, cladding, and finishing systems. Any improvements in these materials that lead to significant system performance improvements are applicable. High performing insulation with increased R/inch or consumer price reduction of high performance systems are of particular interest. There is also a need for roofing systems that can harness diurnal and seasonal dynamics to reduce heating and cooling loads. Variable emissivity coatings for under roof deck applications would be beneficial; however, they would have to be highly durable and low cost. Solutions to cost and aesthetics barriers to thermochromic surface coatings are also of interest. Additional details on DOE goals for envelope technology development can be found in the DOE BTP Multi-Year Program Plan at http://apps1.eere.energy.gov/buildings/publications/pdfs/corporate/myp08complete.pdf. Envelope technology development projects of particular interest under this Technical Subtopic include:

- Envelope system improvements and fundamental new technologies for net-zero energy homes. These technologies include cost-effective R30 walls and R50 roofs with dynamic capability/thermal mass. While there are promising new high performance foundation systems for new construction, there is still the need for higher performing and lower cost systems. Practical insulated foundation systems with at least R10 are also of interest. R values, for the purposes of envelope technology development, represent the entire building component R value not including cavities as prescribed by building codes. DOE BTP priorities are focused on advanced technologies, addressing design issues, including size and moisture, and establishing a pathway to commercialization of advanced technologies.

- Innovation of new systems designed specifically for the retrofit market for any building envelope, window or façade system. Many building products are highly cost effective for new construction, but are not economically viable in the retrofit market due to the complexity of installation and high retrofit labor costs. The DOE BTP is particularly interested in new retrofit envelope components or systems that can be installed more easily, at lower cost, and with higher installed energy performance. While developed envelope components or systems can offer higher performance, the DOE BTP is also interested in envelope components or systems with modest performance gains but at very low price premiums for lower income consumers.

Technical Subtopic 3.3: Building Envelope and Window Case Studies and Demonstrations (This Technical Subtopic seeks 50% cost share.)

Collaborative projects are requested to showcase newly available high performance building envelope and widow technologies that lack market penetration (less than a few percentage points market share) and adequate scientifically documented real-world application/installation performance. The intent is to demonstrate installation performance and document energy savings, peak energy demand and load reduction, and any non-energy benefits. Proposed projects must present an economic/business model for successful replication of the demonstrated application. The intent is not to show unique performance for special technologies with donated products, but to validate a technology's readiness for widespread market acceptance. New technologies that are innovative and high performance that have sufficient scientific case study documentation are not applicable.

Technical Subtopic 3.4: Production Engineering for R5 and Higher Windows (This Technical Subtopic seeks 50% cost share.)

Projects are requested to develop high volume R5 highly insulating windows for the residential market and the "punched opening" (framed window) commercial market. The windows are expected to achieve a whole window National Fenestration Council Rating U-value between 0.19 and 0.22 for fixed and double hung windows, respectively, and demonstrate a SHGC greater than 0.30 for residential and any SHGC for commercial applications. Many factors influence window price, including framing materials, warranty, structural performance ratings, etc. However, from a macro nominal perspective, a rough estimate for a typical new 12 square foot window is approximately $200. Although highly dependent on energy cost and climate region, the price of the same 12 square foot highly insulated window cannot exceed $250 to be cost effective for most consumers. Projects may include one or all of the major phases of production engineering, including product design refinement, production equipment design, pilot production line installation at a major insulating glass unit or window company factory, and promotion of the R5 window products.

Area of Interest 4: Residential and Commercial HVAC and Crosscutting Air Conditioning and Refrigeration Research

Area of Interest 4 seeks to dramatically increase the efficiency of HVAC systems and pursue technologies that apply to both air conditioning and refrigeration. HVAC Systems which enable the cost-effective construction of net-zero energy homes or provide a pathway toward net-zero energy commercial buildings are of particular interest.

Equipment and systems used to provide thermal comfort and adequate indoor air quality consume about 30% of the total primary energy used in residential and commercial buildings. Reducing space conditioning energy usage, which accounts for approximately 39% of primary energy consumption in residential buildings, is essential to achieving DOE BTP net-zero energy home goals. Significant space conditioning energy reductions can be achieved by increasing equipment efficiency, distributing thermal

energy more efficiently, ensuring that optimal equipment performance is maintained throughout the equipment lifetime, and more closely meeting the comfort needs of building occupants.

The rated efficiency of some types of heating and cooling equipment has improved significantly in recent years. However, there is still a need for cost effective and affordable advanced materials, components, refrigeration cycles, and system designs to improve efficiency. Rather than focusing solely on rated equipment efficiency, as measured by Energy Efficiency Rating (EER) or Seasonal Energy Efficiency Ratio (SEER), it is necessary to understand and improve the energy consumption of entire systems throughout the entire operating regime to reduce annual energy consumption of the complete HVAC system. Proposers should ensure that concepts address this system approach. Because HVAC systems operate at conditions other than full load most of the time, technologies or systems that maximize partial load efficiency, but not to a measurable decrement of the peak load performance, are of particular interest.

Even the most energy efficient equipment frequently suffers from significant performance losses in the field from installation deficiencies, operational effects and long-term degradation. For example, performance losses in the field often arise from incorrect refrigerant charge, improper indoor air flow, overcapacity, and fouling of filters and heat exchangers in unitary air-conditioners and heat pumps. New technology is needed to minimize these types of losses and to facilitate proper installation, commissioning and performance monitoring for all types of equipment.

Increasing concerns and new regulations regarding indoor air quality have increased requirements for outdoor air in commercial buildings, which also increases building energy consumption. Homes constructed in recent years, and the net-zero energy homes envisioned for the future, have relatively tight envelopes, which can result in poor indoor air quality and create humidity control problems. Consequently, there is a need for improved technology for cost effectively controlling humidity and improving overall indoor air quality in new and existing residential and commercial buildings, while simultaneously reducing overall energy consumption.

Because the building stock increases by only a few percent annually, concepts which are only applicable to new construction will have limited energy savings potential. Therefore, concepts which are applicable to both new construction and retrofits of existing buildings are particularly encouraged. Area of Interest 4 requests applications for projects in response to the following 3 Technical Subtopics:

Technical Subtopic 4.1: Residential HVAC (This Technical Subtopic seeks 20% cost share.)

Projects are requested for residential HVAC systems which promise dramatic improvements in energy efficiency with modest consumer price premiums and which are suitable for net-zero energy homes. Particular technologies of interest include, but are not limited to:

- Very High Performance Air Conditioning (VHPAC) Systems for Net-Zero Energy Homes (including heat pump technology): A VHPAC system would achieve a 30% reduction in annual energy use and an incremental installed price premium of $1000 relative to a current SEER 18/EER 13.4 2-speed system with tight ducts in conditioned space. The VHPAC performance goal is an overall system performance goal and includes savings from efficiency (improvements in coefficient of performance (COP)), zoning, night cooling, evaporative cooling, heat recovery, and capacity modulation.

- Multi-function HVAC and water heating systems: Innovative approaches to combining space conditioning and water heating, targeting 50% reduction in annual energy consumption relative to today's standard construction practices, are sought. These systems must also maintain uniform comfort, humidity control, and indoor air quality, and be suitable for the lower cooling loads (< 2 tons) expected in highly insulated net-zero energy homes.

- Thermal Distribution Systems: Problems with thermal distribution systems, including duct system designs, insulation materials and installation practices are a major source of system inefficiency. Technology is needed to reduce losses in distribution systems, including a reduction by a factor of 3 to 5 in total duct thermal losses under peak loading conditions for duct systems and air handlers that cannot be moved into conditioned spaces.

- High Performance Cold Climate Heat Pumps: In cold climate regions where natural gas in not available, advanced cold climate heat pumps are needed which can maintain both capacity and COP down to very low ambient temperatures. These system designs could include multi-stage units, ground source heat pumps, alternative refrigerants, and other innovative approaches that maintain performance and cost competitiveness. The units should be sized for expected net-zero energy home heating loads (i.e. 40,000 - 60,000 BTU/hour at nominal 47°F rating conditions). Performance targets are as follows:

Cold Climate Heat Pumps Performance Targets		
Ambient Temperature (°F)	Minimum COP	Maximum % capacity degradation from nominal
47 (nominal rating point)	4	0
17	3.5	10
-13	3	25

Technical Subtopic 4.2: Commercial HVAC (This Technical Subtopic seeks 20% cost share.)

The goal of DOE BTP program is to achieve market ready net-zero energy commercial buildings by 2025. The precise HVAC requirement for such buildings will vary considerably depending on the building type, but it is evident that new approaches to comfort conditioning and ensuring indoor air quality will be necessary. Projects are requested to demonstrate the potential to achieve commercial HVAC energy consumption reductions of 30-50% compared to typical direct expansion, 11 EER, rooftop equipment with conventional ventilation systems in low-rise buildings. Projects are requested for larger, high-rise building, reductions in HVAC energy consumption of 30-50% compared to current chilled water systems paired with conventional ventilation equipment that meet American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) 90.1 requirements. Particular technologies of interest for commercial systems include, but are not limited to:

- Radiant Cooling: Radiant cooling can significantly reduce energy consumption by reducing air moving power and operating at higher evaporator temperatures (thus reducing compressor power consumption). Radiant cooling technology can work well in dry climates, but a separate dehumidification system is necessary in humid climates. Radiant cooling systems are available but further development is needed, as well as demonstration of the feasibility and cost-effectiveness of the technology in various climate zones.

- Fuel-fired Heat Pumps: Fuel-fired heat pumps can provide substantial reductions in primary energy consumption for heating and cooling through cycles such as absorption, Rankine, and Stirling-Stirling. Proposals which demonstrate the potential for dramatic improvements in efficiency or cost reduction relative to existing products are encouraged.

- Desiccant Cooling: Desiccant cooling systems can be powered by waste heat from distributed power generation equipment or refrigeration systems. Desiccants remove humidity from the space, enabling the standard air conditioning systems to operate far more efficiently, while greatly enhancing occupant comfort. New desiccant technologies are becoming available, including new liquid desiccants and polymer desiccant membranes. Coupling these desiccant systems with typical rooftop air conditioners would provide numerous benefits.

Technical Subtopic 4.3: Crosscutting Air Conditioning and Refrigeration Research (This Technical Subtopic seeks 20% cost share.)

Many technologies apply to both air conditioning and refrigeration. Proposals are requested for the technologies described below, but applicants must describe the primary markets that their research will target and explain how they will meet the quantitative targets discussed for air conditioning in the HVAC area subtopics (4.1 and 4.2) or refrigeration systems for the Appliances area subtopics (5.2 and 5.3).

- Nanotechnology: Research is request for nanotechnology applications in air conditioning and refrigeration systems. Nanoparticles could be added to refrigerants or lubricants to enhance heat transfer, as has been shown in some early stage research. Nanostructures for heat exchangers could enhance boundary layer stirring or enable very thin fin structures to be manufactured, enabling greater heat transfer per unit of area.

- Zero Global Warming Potential Refrigerants: Considerable interest is being generated in non-fluorocarbon refrigerants which have negligible direct global warming potential. Carbon dioxide is one option that has been the subject of considerable research, but its inherent thermodynamic cycle efficiency is lower than that of conventional refrigerants unless other means are used to boost efficiency. Using water as a refrigerant has also been explored, but such systems appear to be very complex, large, and costly. Research is requested to explore ways to achieve high efficiencies with such "natural" refrigerants or other refrigerants which have negligible direct global warming potential.

- Non-vapor Compression Cooling Systems: Alternative refrigeration cycles such as magnetocaloric, thermoacoustic, and thermoelectric cooling have all been explored for many years, with very limited commercial success. Research is requested that leverages recent technological advances in materials or electronics, and that demonstrate how to overcome the barriers encountered in previous research to achieve successful commercialization. However, proposals which simply repeat prior research will not be considered.

Area of Interest 5: Water Heating, Residential and Commercial Appliances and MELs

Area of Interest 5 seeks to increase the efficiency of water heating equipment and appliances and to reduce parasitic miscellaneous electric loads. Technologies that contribute to and enhance the pathway to net-zero energy homes and commercial buildings are of particular interest. Area of Interest 5 requests applications for projects in response to the following 4 Technical Subtopics:

Technical Subtopic 5.1: Water Heating (This Technical Subtopic seeks 20% cost share.)

Water heating accounts for about 10% of the primary energy use in all buildings, including 13% in the residential sector. Consequently, high efficiency options are essential for net-zero energy homes to become a cost effective reality. Electric heat pump water heaters use about half the energy of typical electric resistance water heaters but have very high consumer price premiums and negligible market share. Conventional gas water heater efficiencies have been fairly stagnant, though some products have achieved very high efficiencies. However, in the residential sector, these products typically cost at least double that of standard units. DOE BTP is interested in the development of the next generation of water heating products that have dramatically lower consumer price premiums while offering substantial energy savings. Fuel fired heat pumps or integration with renewable energy sources are possible methods of increasing energy savings. Projects are requested for the following in support of the DOE BTP net-zero energy home goals (similar approaches for commercial water heating applications will also be considered):

- Domestic hot water heating systems suitable for cold climates which can achieve a 30% reduction in annual energy usage relative to a tankless gas water heater with an Energy Factor (EF) rating of 0.8 at an incremental installed price not to exceed $2000.

- Low loss hot water distribution systems with occupancy based controls to reduce standby losses and low-cost, easy-to-install integrated waste heat recovery, which can achieve approximately 20% system energy savings relative to conventional distribution systems.

Technical Subtopic 5.2: Residential Appliances (This Technical Subtopic seeks 20% cost share.)

Household appliances such as refrigerators and laundry equipment consume substantial amounts of energy in the residential sector. In a net-zero energy home, space conditioning energy loads are reduced dramatically, so appliance loads become even more critical. Although refrigerator efficiencies have improved considerably in recent years due to increasingly stringent minimum efficiency standards and the availability of Energy Star® units, refrigeration still accounts for over 7% of residential primary energy usage. Laundry equipment, mostly for clothes drying, accounts for about 5% of residential primary energy usage (excluding water heating energy). However, few high efficiency options are available for clothes dryers.

Projects are requested for residential refrigerators that reduce energy consumption by 30-50% relative to Federal minimum efficiency standards, with manufacturing cost premiums of <$100 and clothes dryers, at modest manufacturing cost premiums, that reduce energy consumption by at least 25% (natural gas) or 50% (electric). Proposals must include sufficient information on the applicant's cost structure to allow evaluation of the potential to meet this manufacturing cost premium target. For concepts that have been considered in the past, it is essential that proposers demonstrate knowledge of prior efforts and explain how they will overcome technical and economic barriers that have prevented successful commercialization in prior development efforts. Furthermore, concepts with measurable non-energy benefits, which are important for market success, are particularly encouraged.

Technical Subtopic 5.3: Commercial Appliances (This Technical Subtopic seeks 20% cost share.)

Highly efficient commercial refrigeration has emerged as a critical need in the DOE BTP Net-Zero Energy Commercial Building Initiative. In certain commercial sectors, such as food sales and foodservice, refrigeration is particularly important and dramatic improvements are necessary to enable net-zero energy commercial buildings. Commercial refrigeration projects are requested in the following areas:

- Supermarket refrigeration systems and components, including compressor racks and display cases, which reduce energy consumption by 30-50% relative to conventional systems. Approaches may include ground coupled systems, advanced control strategies, secondary refrigeration loops using non-fluorocarbon refrigerants, or innovative waste heat recovery processes which may be used for desiccant regeneration.

- Advanced insulation for self-contained and closed-door supermarket rack refrigeration equipment. Technologies such as aerogels and vacuum insulated panels (VIPs) are available but are very complex and expensive to manufacture. VIPs are also very fragile. However, it is conceivable that "active" vacuum panels could be developed that use small vacuum pumps to maintain sufficient vacuum as leakage occurs, enabling far simpler and cheaper manufacturing of the panels. Breakthroughs are sought which provide dramatic improvements in the manufacturing costs of advanced insulated doors and panels.

Technical Subtopic 5.4: Miscellaneous Electric Load Reduction (This Technical Subtopic seeks 20% cost share.)

Projects are requested to establish the absolute energy usage and trends for discrete categories of MELs and develop conservation or efficiency approaches to reduce energy use from the largest consuming categories. The Energy Information Agency's "Annual Energy Outlook 2008" (http://www.eia.doe.gov/oiaf/archive/aeo08/index.html) estimates that the combination of non-PC office equipment and "other" MEL energy consumption will grow 57% between 2009 and 2030. For this reason, DOE BTP is focusing on these two end-use categories. All types of electrical devices that contribute to miscellaneous electric loads need to be examined to maximize transformer and other component efficiencies and minimize standby losses. The DOE BTP targets (see table) are to reduce miscellaneous electric loads by 60 percent at nighttime and 25 percent during peak hours.

Characteristics	Units	Calendar Year	
		2009 Baseline	ZEB Target
Miscellaneous Electric Loads	Percent Nighttime Energy Reduction	Minimum Code (to Energy Star)	60
	Percent Peak Energy Reduction	Minimum Code (to Energy Star)	25
	Standby Power (Watt)		<1

Area of Interest 6: Solar Heating and Cooling (SHC)

Area of Interest 6 seeks to develop and deploy the next generation of solar heating, cooling, dehumidification, energy storage and hot water heating products and installations in support of the DOE BTP net-zero energy buildings goals. Concepts which are applicable to both new construction and building retrofits are particularly encouraged. Enhanced integration of SHC products into the building envelope, conventional building HVAC systems and the building construction process is critical (e.g., incorporating plug-and-play, appliance like features). Proposed products should have substantially improved installed price, reliability, durability, and maintainability than existing products. It is likely that most system concepts will be solar-assisted, meaning that they will be hybrid systems incorporating both solar and conventional technologies. Particular technologies of interest include, but are not limited to:

- Solar Water Heating, Space Heating and Cooling
  - Advanced concepts for integrated space conditioning and water heating systems.
  - Low-cost concepts for high temperature evacuated tube or concentrating solar collectors, or alternative high temperature designs.
  - Low cost polymer-based solar thermal components and systems with improved cost effectiveness, especially for cold climate zones.
  - Advanced thermal energy storage systems optimized for SHC conditions, using phase-change materials, nanotechnologies, sorption storage, thermo-chemical technologies, or central community scale storage approaches.
  - Improved building integration of solar collectors to create true building integrated systems to address cost, aesthetics, durability, building process, maintenance and operational issues.
  - Improved solar collectors, incorporating approaches such as advanced glazing materials and antireflective coatings, as well as spectrally selective coatings for absorbers.

- Solar Cooling
  - Advanced solar cooling systems including solar-assisted absorption and solar adsorption cycles, particularly for residential and light commercial applications.
  - Solar-assisted liquid or solid desiccant-based cooling systems.

- Packaged hybrid thermally-driven and vapor compression cooling systems (e.g. cascaded compression/absorption or compression/adsorption cycles).
- Dual source solar assisted heat pumps with advanced control switching between ambient air and ground coupling energy sources.

- Combination thermal-electric hybrid module concepts using renewable electric generation technologies such as photovoltaics (PV) and concentrating solar power (CSP) with a focus on innovative thermal management techniques for the solar thermal element of the module. Note that PV and CSP module research is not eligible for funding under this Announcement.

Area of Interest 6 requests applications for projects in response to the following 2 Technical Subtopics:

Technical Subtopic 6.1: Residential SHC R&D (This Technical Subtopic seeks 20% cost share.)

Proposals are sought for residential SHC and water heating systems which are suitable for both net-zero energy and existing homes. Concepts may address space heating or cooling only, both heating and cooling, or water heating. Combined space conditioning and water heating systems are also of interest. Projects are requested for system concepts or enabling components, technologies or manufacturing processes that significantly enhance residential building-integrated, easily installed SHC products that increase their cost-effectiveness, reliability, durability, management and operation. Plug-and-play appliance-like features that enhance integration of SHC products into the building envelope, conventional residential building HVAC systems and construction processes are encouraged.

The DOE BTP SHC system development target is to reduce overall annual energy consumption by 50% relative to baseline systems and standard construction practices. HVAC baseline targets systems are 13 SEER and 7.7 Heating Seasonal Performance Factor (HSPF) central air conditioner/heat pumps. Water heating system baseline targets are a 50% reduction in annual energy usage relative to 0.6 EF gas water heaters for mild climates and a 30% reduction in annual energy usage relative to 0.8 EF tankless water heaters at an incremental installed price premium not to exceed $2000 for cold climates. Systems must also maintain uniform comfort, humidity control, and indoor air quality. Space conditioning systems suitable for the lower heating and cooling loads (< 2 tons cooling, 40,000 – 60,000 BTU/hr heating) in highly insulated net-zero energy homes present a market opportunity for new cost-competitive SHC systems. The incremental installed consumer price of developed systems should show the potential to achieve, at high volume production, a simple payback period of less than 10 years. SHC systems suitable for cold climates are particularly challenging and are, therefore, of particular interest.

Technical Subtopic 6.2: Commercial SHC R&D (This Technical Subtopic seeks 20% cost share.)

The DOE BTP goal is to achieve market ready net-zero energy commercial buildings by 2025. The HVAC requirement for such buildings will vary considerably depending on building type, but new approaches to comfort conditioning and indoor air quality will be necessary. Projects are requested for commercial building SHC systems which demonstrate the potential to achieve:

- Reductions in HVAC energy consumption of 30-50% compared to typical direct expansion, 11 EER at 80% combustion efficiency, rooftop equipment with conventional ventilation systems in low rise buildings.

- Reductions in HVAC energy consumption of 30-50% compared to current chilled water systems which meet ASHRAE 90.1 requirements and are paired with conventional ventilation equipment in larger high rise buildings.

Although it is likely that such systems will require substantial price premiums compared to conventional equipment, applicants must demonstrate the potential to reduce price premiums in the long term, at large production volumes, such that the proposed systems can become commercially viable.

CERTIFICATE OF SERVICE

I HEREBY CERTIFY that true and correct copies of the foregoing have been served by Electronic Mail and/or U. S. Mail this 27th day of July, 2009 upon the following:

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