Submission Date: Priority: of

Ted Stevens

United States Senator for Alaska

Please Note:
- Fill out one request form for each request
- This form (and any attachments) can be returned via:
  - Fax - (202) 224-2354
  - Mail - The Honorable Ted Stevens
    United States Senate
    522 Hart Senate Office Bldg.
    Washington, D.C. 20510
- **Requests are due by February 15, 2008.**

FISCAL YEAR 2009 PROJECT REQUEST FORM

Project Name: Product Testing and Development for Cold Climates

Project Location: Cold Climate Housing Research Center, Fairbanks, Alaska

Project Description (please attach additional pages as required):

See attached

Related Appropriations Bill: THUD

Amount of federal funding requested for FY09: $399,958.00

Total funding to complete this project: $399,958.00

Number of years to fund this project: one

Matching funds from the State of Alaska: $121,182

Matching funds from local and private entities:

$161,000

If this project was funded in prior appropriations bills (within the last five years), list each bill and the amount funded:

USDA/DRD - $266,667

Amount included in the President's FY09 Budget: 0

Amount included in the State of Alaska FY09 Budget: 0

☐ Check this box if state funding was sought but not provided.

List legislation that authorizes this project:

N/A

Check all that apply:

☐ A change in the current law is necessary in order to proceed with the project. If so, attach language and a list of laws that need to be amended.

☐ Bill or report languages needed. If so, attach requested language.

Product Testing and Development for Cold Climates

Project Description

Introduction:

The funding sought in this proposal will provide the resources needed to launch the Product Testing and Development for Cold Climates Program at the Cold Climate Housing and Research Center (CCHRC). This program will carry out the testing procedures required to evaluate how well a specific product, material, or technology works in the cold climate of Alaska. With the completion of our Research and Testing Facility, we now seek this funding to realize our full potential.

Formed in 1999, the CCHRC is an industry-based non-profit organization whose mission is *"Promoting and advancing the development of healthy, durable, and sustainable shelter for Alaskans and other circumpolar people through applied research."* The Alaska State Home Building Association (ASHBA), recognizing that there was a dearth of original research on the efficacy of current building practices in cold climates, established the CCHRC. Based upon their extensive experience and expertise in building structures in Alaska, they realized that more energy efficient, affordable, and sustainable structures could be built, leading to improved quality of life for residents and workers and cost savings to homeowners and businesses.

CCHRC founders identified Fairbanks as the right location to conduct this important research, capitalizing on Alaska's unique geographic setting. Interior Alaska is the perfect place for cold climate housing research for a variety reasons. First, there are over six months of winter; second, there are a variety of world class research and engineering resources within the region; and third, there is a cluster of large innovative private sector construction contractors in the area.

The foundation of CCHRC's agenda is the Research and Testing Facility (RTF) located adjacent to the University of Alaska, Fairbanks. With help from federal, state, local, and private partners RTF construction was completed in September 2006. The 15,000 square foot RTF is part lab, part model facility for state-of-the-art northern building technology. The facility is designed and constructed to meet the exacting standards of the US Green Building Council LEED Gold rating. Every material, building technique, and system in the structure, from the foundation to the mechanical systems, is designed for cold climates and is being monitored and evaluated for operational efficiency in all weather conditions.

In addition to office, library, and classroom spaces there are two test laboratories, each over 2000 square feet. One lab focuses on product testing and development. The other lab focuses on structural engineering testing and is leased by the University of Alaska Fairbanks, Institute of Northern Engineering. Located near the laboratories are two environmental chambers that, with additional equipment, will enable researchers to recreate extreme conditions at any given time. The laboratories and environmental chambers are essential for CCHRC to work with private sector partners and customers for testing and development of new, energy efficient products and technologies.

Products and energy efficient building techniques that pass the rigorous protocols CCHRC establishes will earn the "Certified Alaska Tough" label.

Program Goals and Objectives:

Development of the Product Testing and Development for Cold Climates Program (Testing Program) will entail:

- The outfitting of the RTF laboratories and environmental chambers to perform product and building technology testing, data analysis, and test reporting.
- The marketing of the RTF facility for cold-weather product testing to product manufacturers—earning the "Certified Alaska Tough" label will enhance the market appeal of their products.
- The dissemination of information to builders associations, housing associations, economic development groups, and business development centers to increase awareness about Certified Alaska Tough products and technologies for application in the field in urban and rural communities.
- The cultivation of relationships with industry partners to develop high value specialty products to be manufactured in Alaska and promote the development of new innovative products.
- The pursuit of equity participation agreements to protect intellectual property resulting from Program research and development.
- Informing policymakers and the public of our ongoing achievements and the importance of the Testing Program.

In order to achieve these goals, CCHRC requires funding for:

- The employment of a full time Testing Program Engineer who will identify the appropriate equipment needs for the Testing Program, establish testing protocols, and conduct testing and development of materials, products, and building components in a controlled environment.
- The purchase of equipment necessary for the instrumentation and outfitting of the RTF's testing lab and environmental chambers for product testing.
- CCHRC data analysis staff for data processing, analysis, and reporting for testing performed on products, materials, and building components.
- CCHRC staff to assist in the installation of testing equipment and in conducting tests of products, materials, and building components.
- CCHRC outreach staff for the dissemination of research and testing results and the coordination of training and certification in energy efficient building products and technologies and energy efficiency standards for field application in the construction industry.
- CCHRC staff for the development of contracts with testing customers.
- CCHRC support staff for the development of brochures and other marketing material to send to appropriate public and private businesses and organizations to ensure their awareness of the Testing Program.

Who Will Benefit:

The primary beneficiaries of the Testing Program services are the people of Alaska, all of whom rely on a strong and vibrant state economy, as well as anyone living in a cold climate (e.g., the Great Lakes Region, the North Eastern and Mid-Western states, mountain states, etc.). CCHRC anticipates that by conducting original cold climate testing of building products and construction techniques we will be doing our part to decrease the costs for homeowners and businesses to heat, power, and maintain their homes and buildings. Skyrocketing energy costs are making electricity and heat unaffordable to many homeowners. As new and existing homes are built or retrofitted using products and building techniques that are "Certified Alaska Tough" for northern climates, the homes will become more energy efficient, use less energy, and be more affordable to heat and power. Also, homes and buildings using these products will be more durable and easier to maintain.

Infrastructure technologies developed and tested in the lower forty-eight often do not always function efficiently in Alaska's extreme climates. There is consequently a great opportunity and a significant need to develop Alaska-appropriate products and technologies that will work in northern conditions. These products and technologies include heating systems, ventilation systems, building envelope and water and sewer systems. For example, the testing of a low-energy use, low cost heat recovery ventilator (HRV) is a priority item on CCHRC's current research agenda. The research and application of better ventilation systems can lead to the improvement of interior air quality. Healthy houses and healthy workplaces help to create healthier communities and lower health costs.

Furthermore, due to the current housing slump, new home construction will likely decrease and there will be fewer well paying construction jobs for Alaskans. CCHRC sees this as an opportunity to encourage the growth of the retrofit industry, and the Product Testing and Development Program will help the retrofit industry by identifying and promoting the best new products for increasing the efficiency and affordability of homes. CCHRC is currently working with the Alaska Housing Finance Corporation and Golden Valley Electric Association to develop and implement a "Built Environment Energy Efficiency Program" (BEEEP) to increase the number of Alaskan retrofits. Part of this program will entail sharing information about the energy efficient products and technologies that are "Certified Alaska Tough." Another aspect of the BEEEP program will be the retraining and certification of unemployed builders to do energy efficient retrofits of existing housing stock. CCHRC's Testing Program will serve to encourage the adoption of energy efficient design, technologies, products, and practices in new construction and retrofits in order to achieve energy efficient goals in residential housing and other buildings.

The promotion of "Certified Alaska Tough" products and building techniques will also increase awareness of the benefits of energy efficient products and technologies. The increased awareness will help consumers who want to make their homes as energy efficient as possible but don't necessarily know which products work best in extreme climates. CCHRC is the ideal place for consumers to come to for information via our website, library, and bookstore. Consumers can attend classes and presentations offered by CCHRC and learn about the Product Testing and Development Program at our weekly tour.

In a larger economic sense, the Product Testing and Development for Cold Climates Program can stimulate and diversify the Alaskan economy as products and technologies can also be manufactured in Alaska and exported to markets where populations have similar environmental challenges. One example would be the testing of geopolymers and magnesium phosphate compound products. These stucco-like materials show great promise as a very durable, low maintenance, waterproof, and fire proof exterior finish for new homes and retrofits. CCHRC sees their use as an affordable solution to building in rural Alaskan villages where most materials must be barged or flown in because these products can use local aggregates and even sea water as part of the mix. CCHRC would like to test the applicability of geopolymer cements made primarily from locally available coal ash for resolving building problems common in different regions of Alaska and provide background information to private enterprises regarding potential in-state product development opportunities.

Partnerships:

CCHRC's outreach partners also provide information resources, adding leverage to the Product Testing and Development Program through the training and education they offer to Alaskans. Outreach partners assist in the dissemination of information of research conducted at CCHRC.

- The University of Alaska Fairbanks Cooperative Extension Service (UAF/CES) provides an outreach service that meets the missions of both CES and CCHRC. CES conducts tours and utilizes the CCHRC's Research and Testing Facility for interpreting and extending cold climate construction knowledge.
- Interior Alaska Building Association (IABA) and CCHRC work together on contractor continuing-education training that is required for contractors to obtain and retain a residential endorsement on their contractor's license. CCHRC will work with IABA to develop a 16-hour coursework for contractors to earn their retrofit endorsement.
- Alaska Building Science Network (ABSN) is a member-supported association dedicated to promoting energy efficiency as an essential component of durable, safe, and affordable housing in Alaska. ABSN and CCHRC work together on professional trainings offered by ABSN and CCHRC.

CCHRC has many other collaborative partners at the state, national, and international level such as the Alaska Housing Finance Corporation (AHFC), Canada Mortgage and Housing Corporation (CMHC), Audubon Sustainable Communities, National Association of Home Builders, and two of the Department of Energy Building America Teams. Private partnerships include GW Scientific, BP, Remote Power, ASHBA, Siemens, and many others. Our partners and members are the ideal stakeholders needed to advance the application of tested and Certified Alaska Tough products and technologies in Alaska and the circumpolar north.

Detailed Project Justification

The Federal government invests a large amount of time, energy, and dollars for research and testing in the arctic. One of the primary federal research arms, the U.S. Arctic Research Commission, recently completed a draft paper making the case that research in the Arctic can address many national concerns. The Commissions' job is to define the U.S. arctic research goals for the country to build sustainable and appropriate research infrastructure. Another federal arm is the Cold Regions Army Corps of Engineers that is leading a government effort to identify core goals for an Arctic infrastructure research program. CCHRC is working with both of these federal agencies to be part of this effort.

In October, 2007, CCHRC hosted the first biennial Sustainable Northern Shelter Forum with financial support from the USARC with the purpose of the development of a research program. Many of the research priorities identified at the forum require a more thoroughly developed building product and techniques testing program. ***The Product Testing and Development for Cold Climates Program is a vital necessity for CCHRC to carry out this research agenda.***

Speakers and panelists from six of the eight Circumpolar countries spoke on the topics of Eco-Municipalities, Sustainable and Appropriate Shelter Issues for First Nations Peoples, Building Science and Technology in the North, Energy and Alternative Energy Systems and Infrastructure, Appropriate Sustainable Design of Buildings, and Communities and Alternative Energy Resources in the North. The following research was identified as a priority by Forum participants and speakers:

Building technology research:

- Which exhaust fan designs provide variable sizing options, controls against back drafting and proper exhaust design with duct hood dampers that won't freeze shut?
- How can heat recovery ventilation (HRV's) systems be improved to work better in cold climates, with reliable defrosting systems, that use less electricity and that require little maintenance?
- How well does the "breathing window" (known as the Dutch Heat Exchanger, a fine wire heat exchanger, or FiWiHex) work in Alaska?
- Which heating appliance is the most energy efficient and cost effective?
- Which building control system is the most user-friendly with good support services?
- What sealing methods for attached garage walls can stop fumes from entering the house?
- What is the most thermally efficient building envelope design?
- How much insulation is needed in walls, attics and foundations for maximum efficiency?
- What are the best insulation materials and application techniques for northern climates?
- What foundation designs can withstand melting permafrost? Potential flooding?

- Do insulating window shutters work in Alaska? Will moving parts on exterior shutters work in the cold? Do breathable interior shutters exist, preventing moisture problems?
- Which window has the highest solar heat gain and lowest U-Value?
- Can homes be designed with attached greenhouses without causing mold problems?
- Does the use of natural building materials increase healthy interior air quality (IAQ) and decrease "sick building syndrome"? In what ways? How much? What materials are best?
- What are the benefits and drawbacks to fire resistant paneling?
- Are geopolymers and magnesium phosphate compounds used as a spray on exterior siding material waterproof, fireproof, and durable in arctic climates?
- What materials are inexpensive, yet very energy efficient, to produce energy efficient and affordable homes?

Alternative and renewable energy research:

- Can properly sized hybrid renewable energy systems provide heat and power to entire rural communities so they are sustainable and economically competitive for business, manufacturing, processing, etc.? How viable is using a variety of local renewable resources such as wind, geothermal, micro-hydro, solar, biomass and municipal waste for rural communities?
- Which heat pumps need only a fraction of the electricity to run compared to heat produced?
- How can cost effective, affordable, small-scale, alternative energy systems such as Combined Heat & Power (CHP) systems become marketable so homeowners and rural communities can afford them?
- Do cylindrical wind turbines with scooped bucket-style blades that can be roof mounted and operate in low wind speeds work in northern climates and not have icing problems?
- Which biomass conversion methods such as gasification, digesters, plasma, Fischer-Tropsch, biomass to liquid fuel or combustion turbines work in Alaska?
- Could biomass agriculture of willow or aspen provide a viable northern fuel resource?
- Can conversion of water to hydrogen be a viable energy strategy in the north?
- What technology works best in the north to use waste heat for greenhouse food production?
- What innovative energy strategies (such as rock energy, soil energy, lake energy, off-gassing and embodied energy) are viable northern technologies?
- Will integrated windows and photovoltaic systems such as Vision Glass being developed by the U.S. Department of Energy work in northern latitudes?
- Will solar forced air integrated wall panels such as SolarWall technology or solar thermal wall panels such as those using FiWiHex technology work at northern latitudes?
- What is the best method for solar heat storage (Glauber's salt, sand, rock, groundwater, wall storage panels, etc.) and what methods work best to reduce heat loss from storage tanks?

Economic Development Need – Alaska's High Energy Costs

The cost of power has risen dramatically in the Fairbanks North Star Borough (FNSB) and throughout Alaska. Anchorage has seen an increase of 35% while Fairbanks increased 39%.[1] The cost of heating oil has more than doubled in the FNSB since 2003. Natural gas customers within the FNSB saw natural gas prices increase 23% in 2007 as supply and shortages led to further rate increases. Out of the total kilowatt per hour charge in Alaskan communities, the average cost for the fuel component is 22.2 cents on a kW/h basis, with the highest paying 56.6 cents on a kW/h basis. Rural communities are the hardest hit, facing overall median utility costs that are 6% higher than in 2000. The cost of diesel has increased 83% since 2000.

Without roads or grid inter-ties to major sources of electric power, approximately 80% of rural communities rely on diesel to generate electricity and heat their homes. Diesel fuel must be barged or flown in. This expensive transportation system contributes to the extremely high cost of power and heating in rural Alaska where the average cost of diesel fuel can range from $5 to $8 per gallon. **Skyrocketing energy costs have created an increased interest in affordable, sustainable energy efficient homes and buildings.**

A comparison of rural, off-the-main-grid communities in Alaska with the Denali Commissions list of "Distressed Communities as Defined by 2006 Surrogate Standard" shows a high degree of correlation.[2] In 2004, 78,166 rural Alaskans would have paid almost $48 million to purchase diesel fuel to power and heat their homes. In 2005, the State of Alaska subsidized $15.4 million of this rural energy through the Power Cost Equalization (PCE) program. Even with PCE, rural communities' power costs went up 40% between 2000 and 2005. Finally, the PCE program is not necessarily sustainable—communities must find other long-term and sustainable energy solutions.

One of the goals of the Product Testing and Development for Cold Climates Program is to increase the numbers of sustainable, energy efficient homes in rural Alaska. Conservation practices and lower energy usage may provide relief to rural communities, reduce the need for state and federal subsidies, and facilitate economic development and economic stability for these communities.

Products tested and developed by CCHRC will help reduce power and heating consumption by ensuring that energy efficient and durable products and building techniques are used in Alaska. Energy conservation is a proven method to lower energy costs and will help to reduce the outflow of money from rural economies. By establishing the Testing Program we increase the likelihood that technologies proven in Fairbanks are transferred to rural Alaskan communities. By creating a point of market entry, the Testing Program will increase the likelihood that sustainable, energy efficient products and technologies are installed in rural villages.

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[1] Ben Saylor and Sharman Haley, *Effects of Rising Utility Costs on Household Budgets 2000-2006* Institute of Social and Economic Research, University of Alaska Anchorage, R.S. No 67, Oct 2006.

[2] http://www.denali.gov/Resource_Center/Program_Documents/Denali%20Commission%20Distressed%20Community%20Criteria%20May%202006%20Update.pdf

Diversification of the Alaskan economy:

Developing new value added industries that create high wage, non-government jobs are particularly important in Fairbanks as one out of three jobs is in government sector. One out of every four jobs is in retail or hospitality, which pays an average monthly wage of $1,901.[3] Nearly a fifth of the population in the Fairbanks North Star Borough is military or military dependents.[4] While the Fairbanks North Star Borough welcomes and supports the individuals and entities behind these demographics, our economy will be more sustainable by diversifying and attracting opportunities that provide high wage jobs with earnings between $40,000 and $65,000, at or above the average FNSB wage of $40,356 per year.

The Alaska economy has a very narrow base. Oil production and federal spending (such as the military) make up two-thirds of that base. Throughout the years, tremendous wealth has come out of Alaska in successive tidal waves of fur, gold, copper, fish, and oil. Alaska struggled economically as a state until the big oil boom of the 70s and early 80s. North Slope oil production peaked at over 2 million barrels per day (bpd) in 1988 and has declined to about 850,000 bpd in 2007. The reliance of our economy on oil, not only to heat and power our homes, but also for jobs, makes diversification even more important.

CCHRC is committed to working towards net zero energy housing for our population in Alaska. Since about 40 % of the energy used in the nation is consumed in the built environment, it is clearly important to increase conservation, energy efficiency, and use of renewable energy. Alaska is no exception. Anything we can do to become better examples and to further serve our population will be to everyone's best interest.

Since we are also major users of fossil fuels anything we do to reduce our fossil fuel consumption will also help in greenhouse gas emissions and help reduce global warming. Since we are at the receiving end of major impacts of global warming, the reduction of fossil fuel usage is a major goal of CCHRC. Indeed, there is almost a perfect storm of concerns building throughout the nation that cuts across many different viewpoints and reinforces the need for reduction in use of fossil fuels. These include peak oil, energy independence, rising costs of energy, global warming, and increasing awareness of the need for conservation. We believe that the approach outlined in this proposal can take us a long way down that path because products proven to be durable and efficient in cold climates will work all that much better in the warmer regions of our country as well.

The Product Testing and Development for Cold Climates Program will enable CCHRC to develop to our full potential and reach a wider audience with the very crucial information of what works well and, conversely, what does not work well in northern climates.

[3] Fall 2007 Community Research Quarterly, p. 20.
[4] Ibid., p. 36.

Budget for CCHRC Product Testing and Development Project

July 1, 2008 - June 30, 2009

TOTAL BUDGET	**$399,958**
CCHRC Personnel	$173,191
Travel	$5,400
Contracts & Services	$11,000
Supplies & Misc.	$7,200
Equipment	$85,000
Occupancy Cost	$63,000
Administration	$51,719
Contingency	$3,448

BUDGET DETAIL

Personnel	Hours	Rate	Cost
Jack Hébert, Pres/CEO	40	$55.00	$2,200
Testing Program Engineer	2080	$50.00	$104,000
Data Analyst	520	$35.50	$18,460
Dave Shippey, Lab Assistant	260	$32.00	$8,320
Outreach Coordinator	260	$31.00	$8,060
Contract Coordinator	40	$23.00	$920
Subtotal - wages			$141,960
Benefits		22	$31,231
Subtotal - personnel			**$173,191**

Travel	Number	Price	Cost
Airfare RT National Labs	2	$1,200	$2,400
Per Diem (days)	10	$300	$3,000
Subtotal - travel			**$5,400**

Contracts			Cost
Consulting services	1	$6,000	$6,000
Testing Equipment Training	1	$2,000	$2,000
			$8,000

Supplies	Months	Rate	Cost
	12	$500	**$6,000**

Miscellaneous	Months	Rate	Cost
	12	$100	**$1,200**

Equipment	Number	Price	Cost
Misc. Equipment	1	$85,000	$85,000
Subtotal - equipment			**$85,000**

Insurance & Audit	Percent	Basis	Cost
Insurance	15	$11,000	$1,650
Audit	15	$9,000	$1,350
Subtotal - Ins. & Audit			**$3,000**

Occupancy Cost	SF	Rate	Cost/Mo.
space	1500	3.5	$5,250
total months/cost	12		**$63,000**

Administration	Percent	Basis	Cost
	15	$344,791	**$51,719**

Contingency	Percent	Basis	Cost
	1	$344,791	**$3,448**

TOTAL	**$399,958**