Message from the President and CEO

Dear CCHRC members and supporters:

We are pleased to present you with the 2008 Annual Report of the Cold Climate Housing Research Center. 2008 was a successful and productive year for the Corporation in meeting our mission, “Promoting and advancing the development of healthy, durable, and sustainable shelter for Alaskans and other circumpolar people.” The timeliness of the establishment of an Alaskan research center focused on the challenges we face here in the built environment has become very apparent.

This was a year that made even more clear the importance of CCHRC’s efforts and the direct effect our contributions can have on improving the quality of lives for residents of the North. The organization and our activities have grown exponentially as a result of demand. That growth reflects the seriousness of a changing environment, diminishing resources and rising energy costs. We have strengthened and expanded our talented staff with more bright, motivated and creative individuals. The results have been a strong project completion rate, expanded activities including multiple new research projects, a significant outreach effort, the establishment of the Product Testing Lab, innovative rural and urban design projects, and private/public consulting contracts.

The challenges we face today as a state, a nation and as members of the global community are unprecedented. Every member of CCHRC’s staff takes very seriously a collective and individual responsibility to contribute positively toward finding solutions and seeing those solutions applied.

CCHRC’s strategic plan is a guide to help prioritize our activities effectively. That plan has two important elements that define CCHRC’s work:

1. Research that directly addresses and finds solutions to problems inherent in building better homes for Alaskans and our Northern neighbors;
2. Getting the results of that research to the people where it can be applied effectively and incorporated understandably. Through applied research, successful demonstration of that research, and a directed educational component, CCHRC is making significant contributions to a more sustainable future.

2008 was a year that demanded quick and effective responses to some very serious and immediate needs of Alaskans. High energy prices, escalating cost of living in both rural and urban Alaska, and significant environmental changes occurring in response to climate change, demanded that CCHRC direct our attention effectively. Some of the programs and projects generated as a proactive action by the research center were:

- The Sustainable Northern Shelter Program (SNS): As a response to the housing, environmental, occupant health, cost of energy and infrastructure crisis in rural Alaska, CCHRC established the SNS Program. This program rep-
resents a significant change in the approach of building and designing homes and supporting infrastructure in isolated and culturally diverse communities. Members of the local community are directly involved in the design and construction of their homes with guidance from CCHRC’s design team. This approach is resulting in more culturally and environmentally compatible designs; dramatic improvement in affordability; increased energy efficiency; and maximum utilization of local human and natural resources. The goal is long term health and sustainability.

- Portal on Retrofits Training and Loans (PORTAL), funded by the Fairbanks North Star Borough and Alaska Housing Finance Corporation (AHFC). Through this office in downtown Fairbanks, our staff provides a connection to the new AHFC Energy Rebate Program for homeowners, builders, and energy raters, as well as providing general information on how homes can become more energy efficient.

- In late 2008, we began outfitting and staffing our Product Testing Lab. It will allow CCHRC to expand its ability to conduct research on the energy efficiency, effectiveness, and durability of a wide variety of home products, from foam insulation to windows and doors. Products that pass the rigorous testing protocols at the lab will earn a “Certified Alaska Tough” rating, a registered trademark of CCHRC. CCHRC staff will spend the next few months establishing lab protocols and outfitting it with testing equipment. We expect the lab to be up and running by mid-2009.

- 2008 also saw us developing and expanding our Outreach department. As our organization and our audiences grow, it becomes increasingly important for us to effectively communicate what we are doing to cold climate builders, architects, policymakers, and homeowners. As you will see in this report, the Outreach department is working hard to accomplish this, and has quickly become an integral part of the organization.

CCHRC continues to have a long-term vision which addresses sustainability in the North through our energy and homebuilding research efforts. The demand side (the structures) must be integrated with the supporting infrastructure (energy production, water and waste water) and many other elements (economies, resources, culture, food, etc.) if the goal of long term sustainability is to be realized. Our mission is focused on the home but in many cases the structure itself can be designed to address some of the other pieces of a successful approach to sustainability. Understanding this relationship has led us to do a number of research and demonstration projects featured in this report. These projects include the Hybrid Micro Energy Program (HMEP), the Wood Energy Project, and monitoring water and waste water systems at the Research and Testing Facility. Projects like the Mobile Test Lab (MTL), the Residential Exterior Membrane Outside insulation TTechnique (REMOTE) and Frost-Protected Shallow Foundations Study (FPSF) advance our knowledge of how to build sustainable and affordable homes in the North.

This 2008 annual report of CCHRC’s activities reflects our commitment to be a significant participant in improving the lives of people that make their homes in Alaska and similar environmentally challenging regions of the planet. Please take some time to review CCHRC’s 2008 projects and activities. We need your input, interest and involvement. A bright and sustainable future will be a collective, global effort. The Cold Climate Housing Research Center is, and will continue to be, a significant and positive contributor to this movement.

Sincerely,

Jack Hébert, President and CEO
Message from the CCHRC Board Chair

CCHRC members and supporters:

What an amazing year! A huge increase in funds for weatherization of Alaska’s structures, record high energy costs, financial melt-downs in the banking and housing industries, and a new direction for research. The Cold Climate Housing Research Center managed to survive and flourish with all of this diverse input.

Early in 2008 the Alaska State Legislature provided funds for weatherization and home energy rebate programs. This $360 million input will have a tremendous impact on upgrading housing across the state for the next two to four years. I hope the Legislature will add funds to this program, so that we can truly become an energy efficient state, with energy efficient homes. Already programs and training of professionals is in place, work has commenced, and progress is being made across the state.

CCHRC’s input in the statewide weatherization effort has been massive. Working in conjunction with Alaska Housing Finance Corporation, we have redirected a major portion of our effort to help facilitate and solve these problems. Positive steps have been made—including a methodology to support each local community and its citizens in resolving their housing infrastructure and energy problems.

The record high energy costs along with the economic meltdown in both the financial and housing sectors have put new emphasis on all the research projects we are pursuing, including photo-voltaics, masonry wood heaters and bio-combustible fuels, among many others. CCHRC will continue to be at the forefront of these types of projects into the foreseeable future.

The people of the North continue to pay some of the highest energy costs in the world. Consequently, it is uniquely important for us to improve our understanding of how we live and adapt to our environment. Climate changes, too, are already having a significant impact in the North.

Building in a circumpolar environment requires answers to many questions. As one of CCHRC’s founders, it has given me great satisfaction to see what the organization has accomplished in answering those questions and advancing a sustainable environment for the residents of the North. My commitment to CCHRC will continue long after my service to the CCHRC Board of Directors concludes because understanding our circumpolar environment is essential to our environment. The Cold Climate Housing Research Center is critical to that effort.

N. Claiborne Porter, Jr. AIA, CGR
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The Program

The Sustainable Northern Shelter program (SNS) is developing energy efficient and affordable homes that can withstand the extreme climatic conditions of Alaska while reflecting a community’s lifestyle and culture. The program involves local residents in each project at all levels of design and construction. Using a charette format and subsequent meetings at each phase, residents’ interests, wants, and needs for housing are identified. Building on this foundation of community participation, SNS is able to combine tradition, modern technology, and environmentally responsible building design. The longevity of homes is addressed by prioritizing the efficiency, durability, and renewability of building components and energy systems while also responding to restrictions of a specific site and the desires of the individual community. On a broad level, SNS contributes to the vitality of northern communities at a time when unprecedented energy costs and difficult economic conditions cause hardship. The SNS process results in comfortable, economical, and long-lasting houses that are a natural fit for the people who call them “home.”
Anaktuvuk Pass

The first site is in Anaktuvuk Pass, the only Nunamiut settlement remaining in Alaska. This community of 312, located in the Brooks Range, is only accessible by plane. Overcrowding, poor indoor air quality, and drafty living spaces are the norm. The average temperature in January is \(-14^\circ F\) with summer temperatures rarely reaching above 50°F. Intense winds beat against frame-constructed homes built in the 1970s which are ill suited to the local environment and living styles. The community, with support from CCHRC and our partners, will build superinsulated homes with advanced heating systems, innovative water storage and wastewater treatment, and renewable energy systems that use local resources. Nearby labor and, to the extent possible, local materials will be used to construct the homes. All of the design ideas hinged on two conditions: engagement of the community and the specific environment.

In early 2008, CCHRC began working with the leaders and stakeholders of Anaktuvuk Pass to explore what kinds of housing suited their needs. In June, the CCHRC design team and village leaders held a design charrette in the community, ensuring that all village residents were able to attend sessions and contribute their ideas. The resulting criteria, floor plan, and building site were further developed by the CCHRC design team. Features include the use of innovative building technologies, a traditional qingok (passive venting system), a roof truss system designed to hold future solar panels, and soy-based spray foam insulation sealed with a spray-applied elastomer liner to insulate the wall system of a semi-subterranean home.

In August, CCHRC staff visited Ilisagvik College in Barrow, Alaska to help develop a construction class for Anaktuvuk Pass residents wanting to build SNS homes. Future homes will be built by local residents, providing the community with new jobs and opportunities for greater participation in the program.

In September, CCHRC staff built a small test module of this system at their Fairbanks Research and Testing Facility, with help from Ilisagvik College, Demilec USA, and Vertex Insulation Inc. Throughout the 2008-2009 winter the test module is being monitored for dew point, humidity, and weather resistance.

In November, after the start of caribou hunting season, CCHRC design team returned to Anaktuvuk Pass to meet with tribal leaders and the Tagiugmiullu Nunamiullu Housing Authority (TNHA) to review the design. Changes were made based on community feedback. In spring 2009, the first full prototype house will be built. A local family will live in the prototype and share their experiences, supplemented with data collected by sensors embedded in the structure to analyze building performance. Any necessary changes will be incorporated in future homes.

Excited about the design, the village tribal administration hopes to expand the project to include more homes in the area. The entire method will be documented in a film so that the process can be analyzed and replicated by other communities.

2008 Highlights

Product Testing Lab

The Lab
CCHRC founders’ long-held plans for a Product Testing Laboratory have come to fruition with the opening of the lab in fall 2008. While in its initial phases, the Product Testing Laboratory is quickly becoming a reality, and will further CCHRC’s mission by expanding our ability to test the energy efficiency, performance, and durability of a wide variety of home products and systems. Yet it will be unique in its focus on the cold climate suitability of these building products. Our dedication to integrity and objectivity will help guarantee the lab has a valuable place in the homebuilding community. CCHRC is developing the Product Testing Lab thanks to generous support from the Alaska Housing Finance Corporation, the Wallace Research Foundation, and CCHRC corporate members.

Testing
- Publicly-funded testing to help the public and homebuilding industry make informed decisions about retrofits and weatherization.

- Fee-based testing for product certification. CCHRC will also certify products and systems for cold climates that meet the standards set by the lab. Products that meet the established standards will receive the “Certified Alaska Tough” rating, a registered trademark of CCHRC.
Progress
Leading the effort is Colin Craven, who joined CCHRC as the Product Testing Director in September 2008. He previously worked as an Environmental Program Manager for the Alaska Department of Environmental Conservation, and as a geologist specializing in environmental remediation and assessment. Colin earned his Masters of Science in Geochemistry from the Georgia Institute of Technology in 2000.

Robbin Garber-Slaght joined the team in late 2008 as the Product Testing Lab Engineer. Robbin earned her Bachelors of Science in Mechanical Engineering from the University of Alaska Fairbanks, and has worked as an engineering technician for Alaska Tent and Tarp conducting laboratory tests for the purpose of product refinement.

Certified Alaska Tough!
Earning the “Certified Alaska Tough” label will require meet standards for two characteristics: performance and durability. While the specific measures of performance and durability will vary for each product type, these characteristics will retain their general definitions to provide consistency regardless of the product being tested.

CCHRC’s “Certified Alaska Tough” trademark and logo was approved and published as a registered trademark with the United States Patent and Trademark Office in May 2008.

Partnerships
The Product Testing Lab staff will work with other research organizations, testing laboratories, and industry members to define testing objectives, assist in selecting the necessary testing equipment, and define testing protocols to evaluate a range of building products and systems. The protocols will be aimed at testing a product’s performance and durability in cold regions like Alaska.

Product Testing Partners
CCHRC is developing the Product Testing Lab thanks to generous support from the Alaska Housing Finance Corporation, the Wallace Research Foundation, and CCHRC corporate members.
The Concept
Opening on July 7, 2008, the Portal on Retrofits Training and Loans (PORTAL) is a CCHRC project whose mission is to help Interior Alaska residents make their homes more energy efficient. The project, funded by the Fairbanks North Star Borough with a grant from Alaska Housing Finance Corporation (AHFC), works in collaboration with the Cooperative Extension Service of the University of Alaska Fairbanks and the Fairbanks Economic Development Corporation.
The PORTAL is a hub for information related to AHFC’s weatherization and rebate programs, Golden Valley Electric Association’s energy saving programs and the Fairbanks North Star Borough’s wood-burning appliance resources. The PORTAL’s staff of five serves customers by meeting with them one-on-one to discuss their needs and challenges, then helping them find the appropriate path toward improving their home’s energy efficiency. This may mean interpreting the meaning of an energy audit or recommending types of building materials to meet the requirements of the audit.

Activities

Between July and December 2008, PORTAL staff helped 1244 customers in person and 3429 by phone. They have also served 3582 website visitors, www.cchrc.org/portal. PORTAL staff also presented to 18 community groups to raise awareness of home retrofitting options. Additionally, the organization set up booths at trade shows and outdoor fairs throughout Alaska’s Interior.

To further educate homeowners, the PORTAL has hosted 26 classes with 472 total attendees on subjects like understanding the retrofit process, burning wood cleanly and efficiently, interpreting energy ratings, saving electricity, and purchasing and maintaining boilers. It has hosted six meetings with Fairbanks area energy-raters to facilitate communication between AHFC and the raters. The PORTAL has also served as an advocate for customers and contractors with local and statewide policy makers, and as a model for similar programs in other parts of Alaska.

The PORTAL advertises its services through paid television, radio, print, and online ads. It also generates media coverage through news releases and by responding to media requests for information.

By the Numbers

4673 customers served
3582 website visits
26 classes hosted
18 community awareness events
6 energy-rater meetings held
The Mission

In mid-2008, the CCHRC Board of Directors determined that the work CCHRC does needed to be shared more broadly. The CCHRC Outreach department started with one employee in 2008 and grew to a staff of five, including Outreach Director, Building Educator, Outreach Librarian, Video Production Manager, and Energy Outreach Consultant whose time is shared with the UAF Cooperative Extension Service.

The Outreach department is devoted to providing knowledge and information about sustainable homebuilding in cold climates and to communicating CCHRC research and building techniques to the building community, policymakers, and the public. As the economy shifts and energy prices vacillate, interest in these topics grows more urgent and our outreach efforts more expansive.
Publications: In 2008, we wrote four new publications, updated our line of research Snapshots, and introduced a new line, Northern Fundamentals, expressly for builders and contractors. Whole House, a series for homeowners, will premiere in early 2009, as will best practices building manuals (for homebuilders and do-it-yourselfers).

Videos: We produce documentaries, instructional videos, and public service announcements. This year’s products include a documentary on the Sustainable Northern Shelter program, showing the collaborative effort between the community of Anaktuvuk Pass, Alaska, and CCHRC consultants, and a documentary featuring the retrofit of the Northern Alaska Environmental Center in Fairbanks, Alaska, which will ultimately result in a best practices video covering home retrofits in cold climates.

Helping builders and owners: Homeowners and builders alike are seeking alternative energy sources, ways of making their homes more energy efficient, and reducing their heating bills. Public tours of the CCHRC Research and Testing Facility, presented weekly, attract the public, builders, school groups, policymakers, and visitors from outside Alaska. CCHRC staff are available to answer individual questions from tour participants and other drop-ins.

Website: CCHRC also has a growing web presence, which was upgraded in 2008, making all of CCHRC’s work available online. Visitors can explore current research projects, print CCHRC publications, or read the “Sustainable” blog, which offers news and commentary. The site averages more than 1000 individual visitors each month.

Media relations: In 2008, the Outreach staff broadened media coverage of CCHRC. Locally, Energy Focus, a CCHRC column in the Fairbanks Daily News-Miner, provides readers with energy efficiency information. Forty-one articles were published in 2008.

CCHRC members: Monthly email updates have increased our contact with individuals interested in CCHRC. Other connections with the homebuilding community include producing newsletter articles for Alaskan homebuilding associations. Our quarterly newsletter is distributed via email, or printed for public outreach.

Conferences, trade shows, and fairs: Active participation across the country helps us meet our goal of reaching the general public and homebuilders. Our lectures, classes, and continuing education are in increasing demand and include topics from explaining home energy ratings to green building for professionals. In 2008, CCHRC staff presented at twenty events.

The Builders’ Resource Library: The library houses about 400 volumes of interest to homebuilders and a small collection of materials for homeowners. Goals for 2009 include circulating materials and using e-readers to provide up-to-date codes and standards to builders at their work site.

By the Numbers

≈ 90 building tours
≈ 1200 consultations
44 articles written by CCHRC
14 news stories about CCHRC
12 conferences
10 videos filmed
10 radio public service announcements
8 educational events
4 press conferences
4 new publications
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**AkWarm Modernization**

The Alaska Housing Finance Corporation (AHFC) offers a wide variety of home loans to Alaskans, and the interest rate awarded to the homeowner partially relies on an energy rating performed by a certified energy-rater. Since 1996 Alaskan homeowners, builders, architects, energy-raters, financiers, and homeowners have used AHFC’s AkWarm software for estimating home energy use. This valuable tool uses a wide range of Alaska-specific databases for weather, fuel, utility, and material costs in more than 200 locations. AHFC staff has collected hundreds of suggestions for improving AkWarm over the last 13 years.

CCHRC research staff is working with AHFC to modernize the software, incorporating new building technologies and techniques so that it will continue to meet Alaska’s home energy modeling needs for many more years. This project will implement as many improvements as can be afforded and completed within the prescribed time-frame. Priority will be given to the most urgently needed changes, as determined by AkWarm users, especially the certified energy-raters performing ratings for AHFC’s current energy rebate and weatherization programs. Alaska Housing Finance Corporation supports this project.

**This Year**

The first three phases of this project were completed in 2008:

- CCHRC contracted with Alaska Building Science Network to analyze available energy rating software to help AHFC determine that modernizing AkWarm was in Alaska’s best interest;
- Analysis North (under contract by CCHRC) created the *AkWarm Reporter* which transformed AkWarm’s results into a document tailored to homeowners’ needs; and
- Analysis North rewrote AkWarm using modern software engineering methods and tools so that future maintenance and the addition of new features will be efficient and affordable.

**What’s Next**

In 2009, the final phase of the project will be completed. It will substantially increase AkWarm’s ability to serve its wide variety of clients.
Alaska Green Building Initiative (AGBI)

In early 2007, the Alaska State Home Building Association (ASHBA) created a green building committee which met twice during the State Home Building Association (HBA) convention in November 2007 to discuss the statewide implementation of the National Association of Home Builders’ (NAHB) proposed green building standards and guidelines. It was suggested that the local HBAs form green building committees and begin by modifying the NAHB guidelines to suit their local environment.

The Cold Climate Housing Research Center was asked to assist ASHBA in implementing the new NAHB Green Building Standards state-wide. This project was created to provide that assistance; it supported travel to two national meetings to learn more about the new standards, funds to create a training program for Alaska, and presentation of at least seven workshops to homebuilders around the state. Since the initial meeting, CCHRC staff has worked with the NAHB Research Center to help create a new American National Standards Institute (ANSI)/NAHB green building standard. These new standards were unveiled at the International Builders’ Show in February 2008.

Member groups of ASHBA requested a change in emphasis for this program, and Steve Wisdom of Wisdom and Associates was trained to deliver a class in green building.

This Year

Wisdom and Associates has offered this class to member groups of ASHBA around the state, including Ketchikan (16 participants), Juneau (15 participants), and Fairbanks (25 participants). In total, AGBI offered green building training and certification for 56 builders in Alaska’s Interior and Southeast, as well as supporting a green building course offered in Anchorage to approximately 50 builders.

What’s Next

2008 saw completion of the initial phase of this project. NAHB National Green Building Standard was approved by American National Standards Institute. In 2009, CCHRC will establish a new project to present the new ANSI/NAHB Green Building Standards across Alaska.
Alaska Retrofit Information System (ARIS)

Working with Alaska Housing Finance Corporation, CCHRC research staff are creating an online database which will help AHFC evaluate the effectiveness of its retrofit programs by collecting, managing, and making accessible information about individual homes. The software will also track all official uses of AkWarm for the rebate and weatherization programs. The database will include information about the residence owner and energy-rater, pre- and post-retrofit energy rating reports, work completed, products used, and cost of each part of the retrofit. It will provide valuable information about estimated versus actual costs, energy savings, and fund use (e.g. by political district) and will provide a strong basis for statistical analysis and follow-up ground-truth studies. Ultimately, AHFC wishes to evaluate the effectiveness of its retrofit programs. The development of ARIS is funded by Alaska Housing Finance Corporation.

This Year

The first phase of this project was completed in 2008. Rating data (historical and current) has been collected and organized into an interim database usable for reporting purposes. For example, a preliminary review indicates that the Energy Rebate Program retrofits will improve energy efficiency by an average of over 20% for participating homes around the state. Current information-handling processes have been analyzed and CCHRC research staff have developed plans for implementing a system that will be more efficient and provide more needed data. Several inefficiencies and bottlenecks will be eliminated, energy-raters will enjoy streamlined submission of their rating results, and homeowners will have easier ways of requesting their rebates and tracking the status of their projects.

What’s Next

In 2009, CCHRC staff, along with our contractors Information Insights and Resource Data, Inc., will implement the central database and an online user interface system.
Applying 21st Century Cements to Alaskan Building Envelope Retrofitting

In recent years, advances have been made in the use of concrete-like materials other than Portland cement for residential building. Alaska and other northern regions are especially interested in using available materials instead of importing the traditionally used heavy products. To this end, CCHRC staff is testing the applicability of commercially available magnesium phosphate cement (MPC) and geopolymer-type materials in the Alaskan climate. Ultimately, this data will allow us to develop basic guidelines for using the materials, which would be used in residential building envelope retrofitting with the Residential Exterior Membrane Outside insulation Technique (REMOTE) wall design developed by CCHRC.

This project is part of CCHRC’s broader effort to foster the development of twenty-first century cements in Alaska using Alaskan resources and to address construction needs and replace Portland cement with materials which consume less energy and make less carbon dioxide when produced. Materials from fly-ash to mining tailings are being tested. One of the notable results of the testing so far is that the process renders harmful chemicals and minerals inert in perpetuity. This project is supported by the Alaska Housing Finance Corporation.

This Year

In 2008, a CCHRC Snapshot summarizing commercially available MPC and geopolymer products was produced and a wealth of information about the related technologies was collected. CCHRC research staff conducted preliminary investigations and experimentation using some of the commercial materials and cements made using Alaskan resources such as fly ash and various mine tailings.

What’s Next

We will test some of the commercial MPC in a REMOTE wall application and continue to evaluate locally available materials. We continue to establish collaborative relationships and pursue additional funding sources for this work.
Frost-Protected Shallow Foundation Study

The frost-protected shallow foundation (FPSF) building technique has been used in Scandinavian countries for many years. In this construction, suitable insulation placed outside of a shallow (hence, less expensive) foundation can protect it from heaving due to seasonal freezing. There is guidance in the International Residential Code for FPSF in regions with air-freezing indexes up to 4000-degree-Fahrenheit-days. Many areas in Alaska exceed this index. The research in this project was part of the Ph.D. project of UAF graduate student Paul Perreault. Alaska Housing Finance Corporation funded this study.

This Year

This project included the purchase of equipment and drilling services to install and monitor five thermocouple strings at each of two houses. Mr. Perreault collected temperature data from the soil under five houses, compared that data to the results of computer modeling, and wrote a draft specification for FPSF for inclusion in residential codes that would apply at air freezing indexes appropriate to Interior and Northern Alaska (4000 - 8000 Air Freezing Days). The thesis work is expected to take several more years, but written materials for this portion of the research are available on the CCHRC website.

A CCHRC Snapshot and a CCHRC Technical Report were produced for this study.
Renewable energy resources are abundant in Alaska, but the lack of daylight in the winter months makes harnessing the energy year-round and having a supply of constant energy particularly challenging. To respond to this challenge CCHRC developed the Hybrid Micro-Energy Project (HMEP), a system which combines several renewable energy sources to provide year-round heat and power to the end user. The demonstration and research project at the CCHRC Research and Testing Facility (RTF) combines solar photo-voltaic (PV), solar thermal, and biomass-driven combined heat and power (CHP).

In the summer when sunlight is abundant, the solar PV and solar thermal systems provide some of the facility’s space heat, domestic hot water, and electricity. In the winter when the sun is scarce, a biomass CHP will use wood to provide space heating, domestic hot water and electricity to the facility.

The goal of the project is to supply the RTF with space heat, domestic hot water, and electricity on an uninterrupted, year-round basis as a demonstration of what is possible in northern latitudes. The economic, environmental, and practical considerations of each system will be reported on CCHRC’s website as sufficient data is available.

This program is supported by the BP Foundation, Fairbanks North Star Borough, State of Alaska, GW Scientific, Remote Power Inc., Siemens, EEInternet, University of Alaska Fairbanks, Cooperative Extension Service, and Golden Valley Electric Association.

This Year
In 2008, solar PV arrays were commissioned and solar thermal collectors were installed. CCHRC’s website was set up to provide real time and historic data produced by the arrays.

What’s Next
In 2009, the Biomass CHP portion of the Hybrid Micro-Energy project will be put online.
PM2.5 Reduction Policy Options and Recommendations

The Environmental Protection Agency, when monitoring air quality, includes the measurement of fine particles that may be suspended in the air for a long while. The particulate matter, or PM, is measured in microns, and particles that measure 2.5 microns or smaller are considered to put those who breathe it at the highest risk. These particulates are called “PM2.5.” The particulates are generated by all sources of combustion: motor vehicles, manufacturing, and wood-burning appliances, etc.

As the cost of heating fuel rose in 2008, the number of wood-burning appliances—including wood-fired boilers and woodstoves—increased dramatically in the Fairbanks area. The Fairbanks North Star Borough (FNSB) exceeds the new PM2.5 limit set by the Environmental Protection Agency and, therefore, is required to reduce PM2.5 levels. It is thought that the large number of wood-burning appliances in the area are a major factor.

At the request of the FNSB, CCHRC research staff have developed policy options and recommendations relating to reducing PM2.5 emissions from residential space heating sources. CCHRC’s work is part of a much larger mitigation planning effort led by the FNSB which includes consideration of stationary and mobile sources, and air-shed modeling. This project is funded by the Fairbanks North Star Borough.

This Year
CCHRC staff have produced a model for computing the amount of PM2.5 that is generated from residential space heating appliances. Research staff built the model and tested it. CCHRC also performed a review of local, state and federal policies on these appliances.

What’s Next
A functional model and a final report will be complete near the end of February 2009.
**Six-Star Green Program**

Over the past several years, interest has been building in the establishment of a system of green credits within the Alaska Housing Finance Corporation (AHFC) Home Energy Rebate Program. This has sometimes been referred to as a “Green Star” or “Six-Star” and would be added to the existing energy rating system, which assigns stars to certain point levels as determined by the AkWarm home energy rating software. AHFC asked that CCHRC develop the guidelines for such a program. This project is funded by the Alaska Housing Finance Corporation.

**This Year**

An outline for how this program could operate was developed:

- The green program will be based on the Interior Alaska Green Building Initiative (which in turn was based on the NAHB Model Green Home Building Guidelines, now the NAHB National Green Building Standard) or other accepted green building programs such as LEED for Homes.

- The energy performance will be determined by using the AkWarm software and the minimum level to qualify will be just above Five-Star Plus.

- It will be necessary to modify AkWarm for this purpose, but the basic point structure can be maintained and extended to above 100 points.

- There will need to be some incentives provided by AHFC to both the builder and the homeowner.

**What’s Next**

After meeting in 2008 with AHFC staff about the program, a draft program description is under development and will be submitted to a select set of reviewers in 2009, prior to submission to AHFC.
State of Alaska End-Use Energy Efficiency Policy Study

CCHRC research staff managed a comprehensive review and analysis of the State of Alaska’s energy efficiency policies and programs. This project focused on end-use efficiency for meeting space-heating and electric power needs in the residential and commercial sectors. Industrial and transportation end-use efficiency issues were not covered. While the scope is statewide, emphasis was placed on the railbelt and roadbelt areas of the state in consideration of the existence of the Alaska Rural Energy Plan.

The primary deliverable is a set of recommended actions that the State of Alaska could take to improve its energy efficiency policies and programs. The main goal for improving these policies and programs is to achieve a cost-effective reduction in the energy demand density in the residential and commercial sectors. Among the associated benefits are reduced energy costs, pollution, and greenhouse gas emissions as well as an improved economy, better health for all Alaskans, and more sustainable and secure communities. This project was funded jointly by the Alaska Energy Authority and the Alaska Housing Finance Corporation.

This Year

A post-award meeting was held December 13, 2007 in Anchorage with Information Insights (under contract to CCHRC) and a steering committee to review the scope of work. A brainstorming meeting was held January 15-16, 2008 in Anchorage with staff from Rocky Mountain Institute, Information Insights, a steering committee, and external review panel. An interim set of recommendations was completed in February so that it could be considered by the governor and legislators during the 2008 legislative session. We presented the preliminary results in various forums to members of the Legislature, the Governor and her staff, members of the Alaska Municipal League, and members of the public. The final report was completed in June 2008.

A CCHRC Technical Report and appendices are available on the CCHRC website.
Wood Energy Appliance Testing

CCHRC is evaluating the economic and environmental considerations of a variety of wood energy appliances for residential use, including wood stoves, pellet stoves, wood boilers, and masonry heaters. The testing will use certified lab comparable testing equipment, but operate the wood-burning appliances in ways similar to their everyday use in homes to see how they perform. Additionally, local cord wood species, wood pellets, barley, and other varieties of pellets will be used to fire the appliances.

The goal of the tests is to understand how wood energy appliances perform both environmentally and economically when operated and fired in real world conditions. As the price of running other heating appliances increases, wood-fired appliances have enjoyed increased use in the North while also causing concern about the emissions of the appliances, and how efficient they can be.

The findings are intended to help inform consumers of the best practices to operate appliances more efficiently, thereby emitting fewer particulates and requiring less wood. The Fairbanks North Star Borough funds this research.

This year

CCHRC staff have reviewed wood energy appliances used throughout the world, especially in cold climates. Research included determining the comparable advantages and disadvantages of using the various types of appliances, including cost, availability of heat source, and potential for local economic development.

Begun in mid-2008, the efficiency testing has thus far included masonry heaters, pellet stoves and a standard woodstove.

What’s Next

The final report will be complete spring/summer 2009.
During 2008, oil prices reached record highs, resulting in a dramatic increase in the public’s interest in sustainable living. More than ever, people are looking to CCHRC for information on energy efficiency, green building, and alternative power systems. CCHRC is uniquely poised to meet people’s needs head-on, combining a mixture of hands-on building experience with scientific knowledge, and working on a breadth of projects from energy research and product testing to K-12 education.

For the past four years CCHRC has been growing to meet the ever increasing demand for our services—our annual operating budget has nearly tripled in four years. Just four years ago CCHRC operated out of a small office in downtown Fairbanks with five staff. In 2006 we moved into our state-of-the art research facility on the University of Alaska Fairbanks campus. By the end of 2008 CCHRC employed 14 people. Today, just a year later, we have 28 full-time employees.

Not only has the size of our budget and staff grown, but so too has our funding diversified. In 2006 we had just two funding sources (the Alaska Housing Finance Corporation and private membership dues); today, while AHFC remains an essential element of our funding, we have 13 separate funders, three of which are funding multiple grants.

As CCHRC grows we are maintaining a stable financial foundation and we are happy to report that our funding looks strong again for 2009. We are confident CCHRC will continue to be able to provide timely and important services to the people of Alaska and the Circumpolar North.
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Support CCHRC
—Join us in changing the world!

CCHRC members and sponsors provide vital, sustaining support for our mission to promote and advance healthy, durable, and sustainable shelter for cold climates. In 2008, donations helped fuel our Sustainable Northern Shelter design project in Anaktuvuk Pass, Alaska, and the development of educational handouts and videos. In the coming year, donations will help us advance the Product Testing Lab and expand the scope of the Hybrid Micro-Energy Project, among other projects.

From walls and roofs to electricity and heat, CCHRC’s mission to promote the cutting edge in northern shelter affects our everyday lives. Your donation to CCHRC makes change happen by providing valuable support to our efforts. Together we can build a more sustainable future.

If you are interested in becoming a member or donating to the CCHRC please contact the Cold Climate Housing Research Center at: (907) 457-3454, or visit our website: www.cchrc.org and click on About Us.