

ALASKA STATE LEGISLATURE
HOUSE COMMUNITY AND REGIONAL AFFAIRS STANDING COMMITTEE

March 17, 2011

8:07 a.m.

MEMBERS PRESENT

Representative Cathy Engstrom Munoz, Chair
Representative Alan Austerman
Representative Dan Saddler
Representative Berta Gardner

MEMBERS ABSENT

Representative Neal Foster, Vice Chair
Representative Alan Dick
Representative Sharon Cissna

COMMITTEE CALENDAR

PRESENTATION: COLD CLIMATE HOUSING RESEARCH CENTER

- HEARD

PREVIOUS COMMITTEE ACTION

No previous action to record

WITNESS REGISTER

JOHN DAVIES, Senior Researcher - Energy Policy
Cold Climate Housing Research Center (CCHRC)
Fairbanks, Alaska

POSITION STATEMENT: Provided a presentation regarding the Cold Climate Housing Research Center.

ACTION NARRATIVE

[8:07:08 AM](#)

CHAIR CATHY ENGSTROM MUNOZ called the House Community and Regional Affairs Standing Committee meeting to order at 8:07 a.m. Representatives Munoz, Austerman, Gardner, and Saddler were present at the call to order.

Presentation: Cold Climate Housing Research Center

8:07:30 AM

CHAIR MUNOZ announced that the only order of business would be a presentation from the Cold Climate Housing Research Center.

8:08:08 AM

JOHN DAVIES, Senior Researcher - Energy Policy, Cold Climate Housing Research Center (CCHRC), began by encouraging members who find themselves in the Fairbanks area to tour the CCHRC building, which he said is the best way to obtain a sense of what CCHRC is about. He then moved on to slide 2 and highlighted that Alaska is facing a diverse number of challenges. Alaska faces many global issues that have local impacts, and therefore one must determine what to do locally to solve the issues for the generations to come. The CCHRC is trying to work on one of the issues facing the state, which is the issue of housing/shelter. He informed the committee that CCHRC is a private nonprofit that was founded in 1999 primarily by members of the Alaska State Home Builders Association and others involved in the building industry in Alaska. At the time CCHRC formed, there was concern that there was very little research being done in Alaska for Alaska. In fact, CCHRC relied on work from the Lower 48 or Canada, although it didn't apply in Alaska due to the state's extreme settings. Jack Hebert, President/CEO of CCHRC, was and is the chief visionary of CCHRC. The mission of CCHRC is: "Promote and advance the development of healthy, durable, and sustainable shelter for Alaskans and other circumpolar people." The CCHRC is a 501(c)(3) nonprofit with an 11 member board of directors with various building industry representatives from throughout Alaska. The organization has about 40 active projects. Although CCHRC has diverse funding sources including state federal, local, and private sources, the state is the primary funding source.

8:12:56 AM

REPRESENTATIVE AUSTERMAN inquired as to the breakdown of CCHRC's finances.

MR. DAVIES directed attention to a pie chart included in the handouts provided to the committee. He estimated the following breakdown: 40 percent state funding, 35 percent federal funding.

8:13:36 AM

MR. DAVIES, returning to his presentation, told the committee that although CCHRC is based in Fairbanks, it considers itself a statewide organization. The organization has done research throughout the state, including Southeast Alaska. No matter the location, the basic approach is the same: ideas are sought; partnerships are sought; projects are formed; results are produced; those results are communicated to the appropriate entities; and the hope through the aforementioned is to effectuate change. In 2006, CCHRC moved into the Research and Testing Facility shown on slide 8. The facility is 15,000 square feet and is an example of how CCHRC tries to do things. The CCHRC Research and Testing Facility is an example of the type of building that should be constructed, although it's modest in its goals. The facility uses less than 50 percent energy than the average building of the same size. Furthermore, it was constructed for less per square foot than comparable buildings in the Fairbanks market. The facility was built to the highest Leadership in Engineering and Environmental Design (LEED) standard. In fact, the facility received LEED Platinum certification. He characterized the facility as a research project itself as it's monitored via 1,200 sensors throughout the building and the ground that measure temperature, humidity, carbon dioxide, soil temperature, moisture in the walls, the amount of fuel used, and more. The facility has a green roof and the water flow of the roof is monitored. Mr. Davies mentioned that tours of the building are given, which he opined is important so that the public can understand how this facility works. He reiterated that the facility embodies how CCHRC works, and that is: to produce specific examples of ways in which people can use less energy and be more efficient. Referring to slide 9, he pointed out that CCHRC has the following five main program areas: applied research and product testing, policy and information, sustainable Northern communities, hybrid micro-energy, and education and outreach.

[8:18:26 AM](#)

CHAIR MUNOZ asked if Mr. Davies is tracking any legislation this session.

MR. DAVIES said that this session CCHRC isn't heavily involved in any legislation going through. Currently, CCHRC is focusing on an update of the policy report CCHRC wrote in 2008. The hope is to present that report in an interim forum prior to the end of this session. However, over the summer the intent is to expand that work to transportation energy efficiency and present

a final report to the legislature in December. The aforementioned will result in more work to identify the best practices in energy efficiency. There will also be a fairly major focus on the Regulatory Commission of Alaska (RCA) issues, in terms of electricity. Therefore, the hope is to provide the legislature with information to use in the next session. The CCHRC also has a fairly large effort in the area of sustainable Northern Communities such that CCHRC works with a community to help design and, in some cases, build a prototype. The aforementioned is monitored and hopefully lessons are learned. Mr. Davies clarified that CCHRC mainly works on the demand side in terms of energy efficiency rather than the energy supply side. However, CCHRC does spend time on projects that relate to a residential scale energy supply. Therefore, CCHRC would work with solar panels, solar thermal, photo electric, ground source heat pumps, and small grade windmills. Lastly, CCHRC has a fairly significant education and outreach effort. The organization has a newsletter, website, courses, and conferences.

8:20:58 AM

MR. DAVIES then reviewed the program areas. Slide 10 relates the various projects CCHRC has done in the area of applied research. For example, exterior insulation was a project that was started in Juneau. The idea is to put most of the insulation on the outside of the wall such that about two-thirds of the insulation value is placed outside the wall. The aforementioned has a number of advantages, including reduction of the potential for condensation in the wall because the wall is now warm. Such insulation construction allows one to build a very tight building. Although it's good in terms of energy, ventilation is necessary otherwise there will be condensation inside the building. A number of buildings in Southeast were constructed in the aforementioned fashion. In fact, CCHRC had a mobile testing laboratory at the University of Alaska Southeast that tested a number of wall types and compared them. The testing illustrated that the wall construction with exterior insulation performed much better than all the other conventional wall construction methods being used.

8:23:52 AM

REPRESENTATIVE SADDLER inquired as to the significance of the two different photographs of the building [on slide 11].

MR. DAVIES explained that the photographs are of a project that was done independent of CCHRC, except that CCHRC helped design and monitor it. The photographs are of the Northern Environmental Center in Fairbanks. He pointed out that the photograph shows stucco on top of foam. The building was retrofit such that three inches of foam was added on the outside of an existing building, which is an area of research CCHRC is performing now. Although the aforementioned works well when done correctly, merely adding foam to the outside of a building can create a double vapor barrier and may trap water in the wall. However, CCHRC has discovered that in many circumstances water isn't trapped in the wall and thus CCHRC is trying to quantify what those circumstances are. For example, CCHRC knows that with a poorly built building to which one inch of insulation is added outside, lots of condensation will run inside of the foam because there isn't enough insulation. Therefore, there is an optimum amount of insulation necessary to keep the condensation surface warm and so it doesn't form ice in the winter. The CCHRC is trying to quantify the amount of insulation necessary.

[8:25:58 AM](#)

REPRESENTATIVE AUSTERMAN asked if research is finding a different amount of foam is needed in the Fairbanks area versus the Juneau area where it is wetter.

MR. DAVIES explained that for the model energy codes, the state was divided into four zones, which are primarily delineated based on the heating degree days. The four zones are as follows: Southeast, Southcentral - Fairbanks, the Interior, and Western Alaska, Aleutians and Kodiak, and the North Slope. There are different insulation standards for each zone and the amount of insulation is also dependent upon a location's microclimate. For instance, those living on a mountain top may want more insulation while those near the beach may not. He indicated that in general, one can't use enough insulation. In further response to Representative Austerman, Mr. Davies said that interested individuals can seek information from CCHRC's website. The Building Energy Efficiency Standards (BEES) are what the Alaska Housing Finance Corporation (AHFC) uses for its construction practices. However, he pointed out that a code is a minimum standard.

[8:28:52 AM](#)

CHAIR MUNOZ asked whether the energy necessary for the ventilation required with outside insulation still makes the overall project more efficient.

MR. DAVIES confirmed that's the case. He then noted that recently there have been advances in electric motors, such that they use about one-third of the energy of a conventional electric motor. He opined that it's important to have healthy air to breath. Still, overall, if the wall construction is more efficient, the net energy result is a savings, even with ventilation costs.

[8:30:30 AM](#)

MR. DAVIES, returning to his presentation, moved on to product testing. One such product testing was performed after questions regarding the performance of reflective insulation arose and it was determined that in most circumstances it doesn't add much. However, there are places where reflective insulation does work, and thus it must be used appropriately. The CCHRC is evaluating various types of windows and window treatments. Slide 14 has a photograph of a motor-driven shutter on the outside of a building. He noted that one of the problems with shutters and insulation is that placing it on the inside incorrectly will likely make the window cold enough that condensation forms on the window. Therefore, generally shuttering on the outside of a window works best.

[8:32:10 AM](#)

MR. DAVIES, moving on to slide 15, related that his current area of focus is regarding policy and information. In 2008, CCHRC developed an Alaska Energy Efficiency Policy Report. The legislature has implemented about two thirds of the recommendations in the aforementioned report. He then directed attention to AkWarm, which is software that has been developed in Alaska and AHFC has delegated the maintenance and upgrade of AkWarm to CCHRC. The AkWarm software is used by the energy raters to rate homes. This rating allows a rater to review the insulation, heating system, windows, and construction of the building to calculate the energy being used and where energy is being lost. Therefore, the AkWarm software is very important. Recently, it was upgraded such that it produces more useful reports and it's being expanded for use on small to mid-size commercial buildings. He informed the committee that the Star rating system is being expanded as CCHRC is developing ratings for a 6-star home and beyond. For instance, a 9-star home might

be a zero energy home with no added exterior energy other than what it collects on site. Two buildings in Fairbanks illustrate the aforementioned is achievable, although it isn't cheap. Mr. Davies also informed the committee that CCHRC has a fairly major contract with AHFC to monitor the weatherization and energy rebate programs. The weatherization and energy rebate programs are doing well with about 30 percent energy efficiency savings. The aforementioned is good, but it could be better. The databases for these programs also illustrate that people are investing their own money. However, there are middle income individuals who are just above qualifying for weatherization and aren't continuing with the program because they don't have enough money to make the necessary changes to their home. Typically, these are homes that need more work. Therefore, the program needs to address this sector.

[8:37:36 AM](#)

MR. DAVIES moved on to slide 18 entitled "Sustainable Northern Communities," and opined that the crisis areas in Alaska are located in rural Alaska. He explained that CCHRC attends meetings and makes its abilities known, and then waits for an invitation to help. He then provided photographs of Anaktuvuk, which is the prototype for this effort. Anaktuvuk, he explained, is off the road system and river system, and thus everything of substance has to be brought in via airplane or snow machine. Furthermore, it's located in the Brooks Range above the tree line and thus it's cold. The location is very challenging. The first thing CCHRC held was a three-day brainstorming session in the village, which uncovered that a building rooted in the ground, not on stilts, was desired by residents. Anaktuvuk used to have sod homes. The aforementioned information as well as indigenous knowledge of the area, such as the direction of the wind, and modern technology was used to create a package for consideration of the local residents. Ultimately, CCHRC built a prototype home as an experiment. The challenge was to construct a building for the climate in an area where everything has to be flown to the area. A typical building requires 5 (indisc.) loads of materials, whereas all the materials for the prototype were flown in on a DC-6. The prototype is buried into the earth with R-60 walls, ceiling, and floor. The building is constructed as a skeleton and then foamed in place. Due to a training regime, college students helped build the prototype. He pointed out that the prototype has solar panels on the front of the building and a wind generator. Furthermore, the building is oriented to the South in order to collect as much energy in the spring and

summer as it can while protecting it from the cold winds from the north. This prototype is using one-tenth of the energy a typical building uses in that community. In response to Representative Austerman, Mr. Davies explained that the prototype building is covered in a heavy liner that is sprayed onto the building and it can be painted. He likened the liner to "stucco on steroids."

[8:43:25 AM](#)

REPRESENTATIVE GARDNER inquired as to who was allowed to live in the prototype.

MR. DAVIES said he didn't know as that was left to the village.

[8:43:48 AM](#)

CHAIR MUNOZ asked if the village is moving forward with additional buildings like the prototype.

MR. DAVIES replied no, but informed the committee that Tagiugmiullu Nunamiullu Housing Authority (TNHA) is now doing the same process in six other villages. Although CCHRC is helping to some degree, it's mainly being left to [TNHA] since they know the process.

[8:44:32 AM](#)

MR. DAVIES informed the committee that the prototype has an experimental sewage treatment plant, which is an area that's struggling in terms of energy [use] due to the continual use of a fan. Therefore, because the fan is running all the time to bring in air, it's also functioning as the ventilation system for the building as well. Mr. Davies opined that this type of sewage treatment plant should be considered for use in other places in Western Alaska. Perhaps, such a plant could be used for clusters of six to eight homes. The process is approved by the Department of Environmental Conservation (DEC). He told the committee that when the effluent is discharged it can be placed right onto the ground.

[8:46:36 AM](#)

REPRESENTATIVE AUSTERMAN asked if the system is small enough to be used in individual homes.

MR. DAVIES replied yes, adding that it was developed for individual homes in Fairbanks that are constructed on permafrost and where a conventional septic system won't work. He mentioned that there are about 300-400 such systems in use in Fairbanks. There is also a different company in Anchorage that manufactures these systems to address small lot sizes on hills. This information is on CCHRC's website. The hope, he said, is that with new motors and a slight variation on the scheme, the energy costs would be driven down to an acceptable level.

[8:47:41 AM](#)

REPRESENTATIVE GARDNER mentioned the City of Unalaska, which has a huge problem with the cost of sewage treatment that the federal government is requiring the city to install. She asked if the aforementioned type of system would make sense for the City of Unalaska, although it's a larger community.

MR. DAVIES answered that he didn't know, but it should be reviewed. He reiterated that the thought had been to run the system for clusters of homes, although such a system could be used for individual homes. Although the system is costly, it's comparable to existing solutions.

[8:48:43 AM](#)

MR. DAVIES, returning to his presentation, directed attention to slide 19, which reviews the multi-step process involved in developing sustainable northern shelter as follows: community invitation, team building, concept, charrette, concept testing, prototype, and documentation. Further information regarding the aforementioned process can be found on CCHRC's website. He related that CCHRC tries to obtain as much knowledge as possible from people and animals in the area as well as taking into consideration the land, soil type, and the past problems of the area. One of the main lessons learned from animals in the north is that retaining heat is important. He reminded the committee that many indigenous people had ingenious ways of surviving in harsh climates. The hope is to combine that indigenous wisdom with 21st century technology to develop a better solution for all in the future.

[8:51:54 AM](#)

MR. DAVIES returned the committee's attention to slide 18, which lists the various communities where sustainable northern projects are located. He then moved on to slide 27 entitled

"Hybrid Micro-Energy." He explained that micro-energy systems are energy systems that are residential scale and hybrid means that it's a collection of different systems. For example, at the CCHRC Research & Testing Facility in Fairbanks, there is solar PV, solar thermal, and wood energy. The hope is to develop a combined heat and power. The notion was to take wood chips and gasify them to make gas to run a diesel generator that generates electricity. Therefore, in the winter solar energy stored in wood would be used to produce electricity and heat for the building. Thus far, the aforementioned project hasn't been successful because a small scale, residential or village size scale system hasn't been identified. The goal, he opined, is to have a building that generates all of its own energy. As indicated earlier, it's possible to construct a building that's thermally independent, but the question now is whether buildings can generate electricity in a variety of ways. Although wind or solar works for individual buildings, they don't work in the winter or when the wind isn't blowing. Therefore, the difficulty is to put together a package that works and is reliable and economic.

[8:55:13 AM](#)

REPRESENTATIVE AUSTERMAN inquired as to the amount of energy solar panels produce on a cloudy day. He also inquired as to the meaning of the term passive solar.

MR. DAVIES answered that solar panels don't produce energy on a cloudy day. He then explained that passive solar is the premise that a building is oriented so that there is heat in. [Solar] PV is considered more of an active system, but the problem is the capacity factor - the percentage of power that a device produces versus its theoretical maximum. The passive factor for [solar] panels in Alaska is around 10 percent, depending upon whether there's a tracker. Mr. Davies said that the panels cost more and they produce about as much more as they cost more. Still, they work. For example, for a tourism business that had to do laundry May through September, it would be a great fit.

[8:57:31 AM](#)

REPRESENTATIVE GARDNER asked where the wood for the wood stove in Anaktuvuk Pass prototype house would come.

MR. DAVIES answered that there is willow in the area, and the stove is designed for use of small sticks and functions as a backup. Most of the time, a small Toyo-type stove is used for

heating, he clarified. In response to Representative Austerman, Mr. Davies related that the foundation is a foam pad on the ground.

[8:58:16 AM](#)

MR. DAVIES moved on to slide 29, and related that almost weekly CCHRC receives calls asking about ground source heat pumps (GSHP). Although GSHP is a proven technology that has been utilized in Alaska, it hasn't been monitored long enough to determine if they work. Therefore, CCHRC is working with the Alaska Center for Energy and Power (ACEP) to perform a massive literature search to identify all the projects that have been put in Alaska. He estimated that there have been over 100 installations of [GSHP] throughout the state, although there isn't much data. One concern is what happens when heat is continually taken from the ground. Questions regarding whether permafrost, a frost heave, or changes in soil conductivity occur over time. The issue driving those concerns is that the ground is being made colder. A potential solution is to heat the ground in the summer and take it out in the winter, which is being done at Weller School in Fairbanks. He characterized this system as a reverse refrigerator.

[9:00:44 AM](#)

MR. DAVIES, in response to Representative Gardner, confirmed that the Juneau International Airport uses [GSHP], but it's relatively new and hasn't produced much data. He mentioned that these are systems that are bored straight down 200 feet like a well. The data from these systems are of interest because they are what most could use as a retrofit for a house. However, Juneau is located close to tide water, which wouldn't be the situation for many places in the state. For the Weller School project a small [GSHP] system that won't be enough to heat the entire school will be used in conjunction with solar thermal collectors on the roof. Therefore, the summer heat will be collected to pump heat back into the ground. A good heat pump system will have a coefficient of performance of at least three, and therefore it will move three times as much energy out of the ground as it takes electricity to run the pumps.

[9:02:35 AM](#)

MR. DAVIES then related that CCHRC has a large education and outreach effort. In fact, CCHRC has a portal to help with the energy rebate program and produced various publications as well

as a website and a library at the facility. Since a recent upgrade to the website, there have been over 6,000 independent accesses of it. Typically, over 1,200 people access the website annually. Also, CCHRC provides tours of the building every week. All of the aforementioned is an effort to demonstrate to folks what CCHRC does and the systems used at the facility. He informed the committee that CCHRC has received funding from the U.S. Department of Housing and Urban Development (HUD) to construct an addition to the facility to accommodate the staff and the increased need for classrooms.

9:04:56 AM

CHAIR MUNOZ thanked Mr. Davies for the presentation and his work. She remarked that she had been particularly intrigued by the unique design of the building in Quinhagak. She then requested that Mr. Davies contact her when the updated policy report is ready to be shared.

MR. DAVIES said he is working with Representative Foster and the House Special Committee on Energy to determine a time to present the updated policy report. In response to Chair Munoz, Mr. Davies indicated he was amenable to a joint meeting between the two committees.

CHAIR MUNOZ mentioned that committee members have been discussing a trip in the summer to Galena, which could be a good time to possibly visit CCHRC.

MR. DAVIES stated that a visit to the facility is the easiest way to understand the work being done by CCHRC.

9:07:25 AM

ADJOURNMENT

There being no further business before the committee, the House Community and Regional Affairs Standing Committee meeting was adjourned at 9:07 a.m.