

I N S I D E

<i>If Wood Energy is a Better Option For Alaska, Why Hasn't it Gone "Viral"?</i>	6
<i>Gathering Momentum</i>	8
<i>The Old and The New</i>	14

Issue #22 / Fall 2015

Alaska's Energy Anxiety

Cold Temperatures and Long Distances

IT'S 24 DEGREES below zero. Exposed skin can be frost-bitten in less than 15 minutes in this type of cold, which commonly blankets much of interior Alaska in the winter. The freezing air carries the smell of diesel exhaust and a hint of burning spruce. The only sounds are dogs barking, the chop of an axe splitting wood, and the drone of a "snow-go"—the local term for snowmobile.

Phil Koontz lives in Galena, a rural village of about 500 people on the bank of the Yukon River in interior Alaska. The nearest village is 30 miles away.

Much of the average Alaska household's energy consumption comes from heating, largely due to the severe climate.

The smells of wood smoke and diesel fuel are a pervasive reminder of the life-sustaining need to stay warm. "I was talking to a friend who lives in the lower 48 about this," said Koontz. "The purpose of our houses is different. I have a one-room house, 800 square feet, nice and tight. My friend has a huge house and even keeps his cars indoors. The purpose of his house is security. My house is for me not to freeze."

The situation Koontz describes could fit any one of the 100 small villages scattered across the vast spaces of remote, roadless Alaska. Reachable only by air or water, these communities are "off



Dan Bihn

The Thorne Bay school in southeast Alaska switched from expensive fuel oil to wood-fired boilers for heat, and used the opportunity to construct a greenhouse that is also heated by the wood boilers. The greenhouse provides a learning environment for students and also fresh vegetables for their lunches.

- Alaska's statewide average annual energy costs per household are frequently more than twice the national average. In 2012, Alaska's energy expenditure per person for all energy uses, not just heating, was \$10,484, ranking it the highest in the Nation.
- Research suggests that the biggest factor in homeowners' willingness to convert to wood energy comes down to the financial tradeoff between the cost of oil and the investment needed to switch to a wood-burning appliance.
- Most of the material used in wood energy comes from byproducts of the forest products industry, which is more feasible in the lower 48 states with more extensive roads and infrastructure. Alaska has not been able to support a profitable forest products industry.
- The wood energy projects that have successfully launched in Alaska provide useful learning opportunities as case studies, but have so far failed to provide a roadmap for commercialization at a scale that truly addresses broader statewide goals of energy independence.
- The Forest Service, USDA Rural Development, Alaska State Division of Forestry, and Alaska Energy Authority support a goal of 30 percent conversion of fossil fuel heating to wood heat in southeast Alaska in the next decade.



the grid"—unconnected to the large-scale electrical system that powers most of Alaska's larger communities. Some rural villages use microgrids: small-scale localized systems usually powered by diesel generators. Homes mostly use fuel oil for heat and some supplement with firewood when available.

Every year, the diesel for generators and the fuel oil for keeping homes warm must be barged in. Severe winter conditions often limit fuel delivery to summer, which means a year's supply of fuel must be stored on site. In some places, maintaining a large storage capacity for fuel has posed significant environmental problems. Leaks and spills have incurred hundreds of millions of dollars a year in clean-up expenses statewide. An assessment in 1999 by the Environmental Protection Agency rated 97 percent of rural Alaska storage tank facilities as seriously deficient. "We've had several floods in Galena that have come through and washed away thousands of fuel drums," said Koontz. "The flood we had last year swept contamination all over town. This is much on people's minds."

Also on people's minds is expense. Energy prices are extremely high in Alaska, particularly for remote villages. This seems paradoxical in a



Dan Bihn

A barge takes on a load at Thorne Bay, Prince of Wales Island, Alaska. Transportation costs are very high in the state. For many remote roadless villages, diesel and fuel oil must be flown or barged in once a year when weather conditions permit.

PNW SCIENCE UPDATE synthesizes current research that addresses pressing questions about management of our natural resources and the environment. It is published by:

Pacific Northwest Research Station
USDA Forest Service
P.O. Box 3890
Portland, Oregon 97208
(503) 808-2592

Cynthia L. Miner, Communications and Applications Director
Frank Vanni, Publishing Director, fvanni@fs.fed.us
Rachel White, Writer and Managing Editor, rachelwhite@fs.fed.us
Jason Blake, Layout, jblake@fs.fed.us
Send change of address information to pnw_pnwpubs@fs.fed.us



Phil Koontz

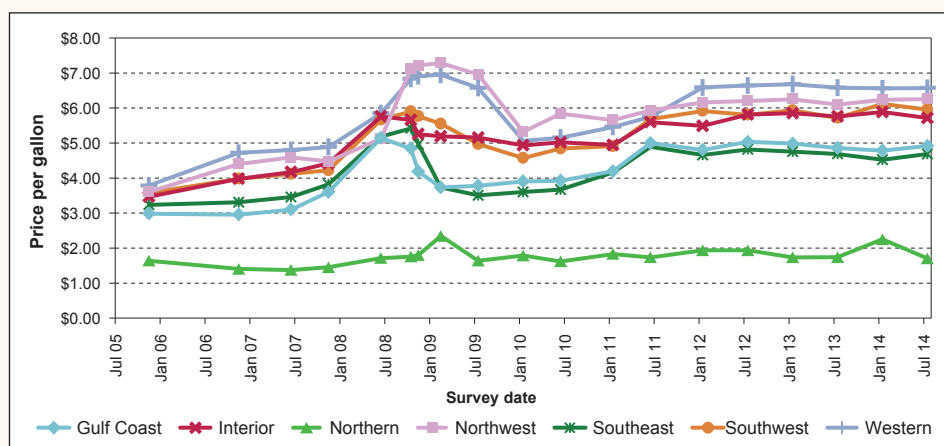
Staying warm involves time, effort, and expense, particularly in some remote communities like Galena where winter temperatures regularly reach -60 degrees. Much of Alaska's household energy consumption comes from heating. Many households supplement oil heat with wood, but gathering firewood can involve traveling a long way by snowmobile.

state so rich in oil reserves: Alaska is the fourth-largest producer of oil in the United States. But there are few refineries, and refiners often face high operating costs that get passed along to consumers. Added to this are the high costs of fuel transport and storage.

In the last 10 years, the statewide average cost of heating fuel in Alaska has increased 68 percent, with a sharp peak in 2008. Heating oil prices in some remote communities, where winter temperatures regularly reach -60 °F, approached \$9.00 per gallon, largely because of transport costs and limited competition. Some towns were forced to close public libraries and community centers, and families had to make agonizing decisions about whether to spend needed food and clothing money on oil to stay warm. Much of the average Alaska household's energy consumption comes from heating, largely because of the severe climate.

Recently, crude oil prices have dropped considerably, but it is unclear what percentage of these cost savings will find its way to remote communities. The statewide average annual energy costs per household are frequently more than twice the national average. In 2012, Alaska's energy expenditure per person for all energy uses, not just heating, was \$10,484, ranking it the highest in the Nation.

The price of heating oil, diesel fuel, and gasoline weighs heavily on Alaskans, particularly for isolated and economically struggling villages. Environmental engineer Bob Deering, who works on energy issues in Alaska, has seen the effect of high fuel costs in bush Alaska. "These communities are dying. Some of them have 80-percent unemployment. Money spent on fossil fuels leaves the community and never returns," he said. Deering was hired by the USDA Forest Service and the state of Alaska to find ways to promote a renewable energy future for Alaska through the use of woody biomass. "The USDA wants to move the needle in a positive direction," he said.



Alaska fuel price report: current community conditions, July 2014. Alaska Department of Commerce, Community, and Economic Development Division of Community and Regional Affairs.

Wood Energy Looks Promising

Alaska's natural resources are not limited to oil. Coastal Alaska has wind and hydropower options, and southeast and interior Alaska have abundant trees. Interior Alaska contains 17 percent of the forested land in the United States. For renewable energy proponents, this looks like a lot of biomass.

Biomass refers to any organic (carbon-based) plant or animal matter. Biomass energy, in the form of heat or power or both, is created by burning that plant or animal matter. In Alaska, biomass sources range from fish processing byproducts to municipal waste and spent grain from beer brewing. But the most commonly used form of biomass fuel is woody material from trees or sawmill residue. Woody biomass is widely dispersed throughout Alaska, often available in the immediate vicinity of rural communities, as opposed to fossil fuels, which are only available from limited

Options for clean and efficient wood heat vary in complexity and feasibility depending on the size of your house or building and the availability of supply.

sites. Wood fuel can be readily collected and processed, often only requiring a chain saw, whereas the processing of crude oil is an expensive industrial process. In addition, transporting and storage of firewood or wood pellets requires few special safeguards, and spilling a load of wood fuel creates minimal environmental contamination compared to oil.

In southeast Alaska where Deering lives, hydropower got more attention earlier in the search for renewable sources of energy. Hydroelectric facilities, which already supply a large portion of the region's electrical power, are well positioned to take advantage of the high rainfall and steep terrain in southeast.

"Politicians were calling southeast Alaska the 'Saudi Arabia of hydropower,'" said Deering. "But the state wanted to get a better handle on all the options in the region." The Alaska legislature contracted with an engineering consulting firm for an in-depth



Dan Bihn

Superior Pellets plant—wood chips in foreground, bagged wood pellets in back. Wood heat systems that burn chips can accommodate a wide range of fuel quality but require large storage facilities. Most of the chip-fired systems in Alaska are in large buildings like schools.

analysis of energy resources in southeast Alaska. After a year of visiting communities and gathering data, the consultant's 2013 assessment stated that hydropower options were running out in the region. "The report showed that it was too expensive to run transmission lines out to villages and that existing hydro facilities were maxing out due to the rapid shift from heating with oil to heating with electricity as a result of high oil prices," said Deering. "The report argued instead that we should think about converting a significant amount of oil and electrical heat in southeast Alaska to woody biomass."

"Woody biomass utilization" can be as simple as burning firewood (also known as cordwood) on a campfire or in your woodstove. In many rural communities, cordwood provides a significant source of heat. But as anyone who has tended a campfire knows, burning wood cleanly requires more sophistication. Options for clean and efficient wood heat vary in complexity and feasibility depending on the size of your house or building and the availability of supply. Some boilers burn wood chips, which can come from sawmill waste, forest harvesting waste, manufacturers, or specially designed chippers. Chips can come from all kinds of tree species, and chip-fired boilers can accommodate a wide variety of fuel quality and moisture content. But chip-fired systems tend to be best suited for large buildings like schools because they require space-hogging storage facilities and automatic chip-feeding systems.

Another biomass option is wood pellets, which might at first glance be mistaken for rabbit food. Their standardized shape and size make them a predictable, uniform fuel source. Their moisture content is lower and more consistent, they burn cleaner and more efficiently, and they take four to five times less storage space than cordwood by weight. Pellets can be burned in pellet stoves in homes and small buildings, or in a wide range of boiler sizes for heating bigger buildings. Because pellet system combustion is largely automated, they can be tuned to their peak efficiency with minimal emissions.

Alaskans currently burn the equivalent of more than 100,000 cords of wood each year as cordwood, chips, and pellets. "Pellets make an ideal wood fuel," said Deering. "They have a high energy density, they handle easily, they work across a whole spectrum of wood-burning devices, and they are subject to internationally accredited standards." Deering has switched to using a pellet boiler in his own home in Juneau, completely replacing his old oil-fired boiler. But the practice has not exactly spread. "I am one of only two houses in town to install a pellet boiler to heat my house," he said. ❧



Dan Bihn

Environmental engineer Bob Deering was hired by the USDA Forest Service and the state of Alaska to promote a renewable energy future for Alaska through the use of woody biomass. "The woody biomass found in abundance in southeast Alaska represents a significant energy resource for local communities," he said. Deering walks the talk: he replaced his oil-fired boiler with a wood pellet boiler in his home in Juneau.

If Wood Energy Is a Better Option for Alaska, Why Hasn't It Gone "Viral?"

Finding the Source of Resistance

DAVID NICHOLLS lives in Sitka. He's a forest products technologist with the U.S. Forest Service Pacific Northwest Research Station. Part of his job is to examine how Alaskan communities might take advantage of renewable energy applications and how those applications might benefit the local economy.

Nicholls led a study that surveyed over 700 people in the five largest cities in Alaska about their willingness to switch to wood heat in their homes. The primary source of heat in southeast and interior Alaska is heating oil, whereas south-central (including Anchorage) mainly relies on natural gas. Nicholls and his colleagues found that the biggest factor in homeowners' willingness to convert to wood energy came down to the financial trade-off between the cost of oil and the investment needed

to switch to a wood-burning appliance. They collected their survey data during the 2008 peak in home heating oil prices. At that time, most respondents claimed that a price range of \$4.00 to \$5.00 per gallon for fuel oil would motivate them to convert to wood energy. However, a surprising number of respondents indicated that they would not switch from fossil fuels to wood heat regardless of price.

Six years later, in July 2014, the price per gallon of fuel oil in 100 surveyed communities in Alaska (excluding the North Slope) averaged \$5.79, above the price range people claimed would induce them to switch to wood. Despite that, there has not yet been a mad rush to convert, either at the residential level or the community level. Clearly, other issues are contributing to this resistance to adopt wood energy solutions.



Jim Baichtal shows the wood pellet boiler that heats his home in Thorne Bay on Prince of Wales Island. A Forest Service study found that the biggest factor in Alaskan homeowners' willingness to convert to wood energy came down to the financial trade-off between the cost of heating oil and the investment needed to switch to a wood-burning appliance.

Dan Bihn

Lack of Support and Maintenance

The Tlingit-Haida Regional Housing Authority (THRHA) has expert knowledge of keeping homes warm. Supporting affordable housing in southeast Alaska since 1973, the THRHA helps residents improve financial literacy, find fair market rentals, apply for home loans, and navigate home repairs and maintenance. In a nutshell, they help homeowners save money and encourage self-sufficiency.

Craig Moore is vice-president for planning and development at THRHA. “I have been with the housing authority for 16 years and I’m very interested in making homes more energy efficient. That is the best bang for your buck,” said Moore. “But there’s only so far you can go with that. The cost of heating oil has become unsustainable, especially in the remote communities that use diesel to generate electricity. They are looking for their own answers to these problems, but these communities just don’t have the economy or resources. We were finding homes where people brought in old, unsafe wood stoves, and installed them haphazardly. The stove barely heated the front of the house, and the back bedrooms would have no heat and be growing mold and mildew.”

Being a long way from nowhere means that help is hard to come by. Moore says this has been a significant barrier to adopting new energy technologies. “In the areas with the highest energy costs, these are semi-subsistence communities,” he said. “There’s hardly any service industry, no contractors, no electricians. If you put in high-tech equipment, there’s no one to maintain it. If it’s down, it’s down for the count. All the big agencies are trying to figure out how to train and certify a workforce to maintain facilities in remote communities. They’re exorbitantly expensive to fix.”

Too Much Work

As Nicholls learned from his survey, another objection people have is that wood-burning appliances require too much work. Cordwood burners are usually loaded manually. Someone has to drop what they are doing and feed the stove, not to mention the routine chores such as removing ash, inspecting fans, and coordinating fuel delivery and storage. If someone is not around to look after these tasks, or if a fossil-fuel backup system is not in place, the building goes cold.



Dan Bihn

Standing next to a wood heating system, Craig Moore is vice president for planning and development at the Tlingit-Haida Regional Housing Authority (THRHA), which helps support affordable housing. “I am very interested in making homes more energy efficient,” he said. “Big community-level wood heating projects can help drive the market and supply system, paving the way for residential wood heating.”



Dan Bihn

An assortment of residential fuel tanks in Ketchikan, Alaska. The grey one to the right contains diesel heating oil. Maintaining storage capacity for fuel is a concern, both in terms of expense and the potential for environmental damage in the case of leaks and spills.

Moore agrees this is a problem. “With firewood, you need someone to cut it, split it, and feed the stove,” he said. “It’s not an answer for the elders or people with disabilities. This is why we are looking at pellets. We need a fuel that’s hands-free like oil, and the only good biomass for that is pellets. The problem with pellets is that right now there is no existing supply network for them in our communities.” 🌱

Gathering Momentum

If We Supply It, Will They Buy It?

EVEN IN HEAVILY forested southeast, home to 34 communities including Sitka, Juneau, and Ketchikan, a wood fuel supply can seem tenuous. “We just don’t have the demand for a large pellet mill in southeast,” said Bob Deering. “I get my pellets from Home Depot in Juneau, but they’re shipped up here from Oregon. There’s a little boutique pellet mill in Ketchikan that operates out of a higher-value milling operation, but it doesn’t sell the pellets retail. It supplies them to the Ketchikan Federal Building and the library. If we had a large mill here that could sell pellets locally at \$170 a ton, no shipping costs added, I think the switch to pellet systems would be rapid.” Pellets currently cost roughly \$300 a ton at Home Depot in Juneau.

Similar logic was behind the launch of Superior Pellet Fuels, LLC, which opened for business in 2010. The Alaska-based company was created exclusively to manufacture wood pellets using local labor and local materials.

“If we had a large mill here that could sell pellets locally at \$170 a ton, no shipping costs added, I think the switch to pellet systems would be rapid.”

“We’re the only large commercial-scale producer of pellets in Alaska,” said sales and marketing manager Cassie Pinkel. “So far the majority of biomass use in the state is in the form of cordwood boilers and chip systems because most places don’t have the millions of dollars you need to start a pellet industry from scratch.” All of Superior’s

product is consumed in the state of Alaska. Its location near Fairbanks, however, does not help residents in Southeast. Fairbanks is over 700 miles from Juneau, for example, and shipping Superior’s pellets to the two households with pellet stoves there wouldn’t be worth it.

The first few years of operation required the company to lower expectations. Anticipating that high fossil fuel costs would provide them with a rapidly growing customer base, they built their plant to be capable of producing 35,000 tons of pellets a year (four times more pellets than the entire state used in 2009). That level of demand has been slow to arrive.



Dan Bihn

Cassie Pinkel is sales and marketing manager at Superior Pellets, the only large, commercial-scale pellet mill in Alaska, located in North Pole. “When we first started, we sold directly to customers in local stores. Two years ago we got a contract with Lowe’s. The market has quadrupled in the last 4 years,” said Pinkel.

“We haven’t come close to full capacity,” said Pinkel. At first, they didn’t have large-scale customers like a school district or a big business. “The majority of our customers come from the residential market,” she said. “When we first started, we sold directly to customers in local stores. But two years ago we got a contract with Lowe’s. This means we can service Anchorage and actually be competitive with the import market. Next we’re hoping to get contracts with Fred Meyer and Safeway.” According to Pinkel, residential pellet use is on the rise. “The market has quadrupled in the last 4 years,” she said.

But even though Superior Pellets has seen their market increase fourfold, it was starting from a tiny slice. Deering explained, “I don’t think wood energy is taking off. We have a ways to go yet. If you look at the biomass projects that get grants and outside funding, a lot of the larger projects are institutional, like government buildings. These projects are spending other people’s money. We just aren’t seeing the private sector projects.”

Interest Continues to Grow

“My wife and I grew up on farms,” said Allen Brackley. “Keeping warm and cutting firewood are second nature to us.” Brackley He is a research forester who works for the USDA Forest Service in Sitka. His studies have examined some of broader forces that play on wood energy opportunities in Alaska such as markets, policies, and competing sources of energy. As he puts it, “I am a 73-year old nerd who analyzes data.” He and his wife have a pellet stove, but when pellet prices go up they switch to firewood, which they cut and split themselves.

“As we move into the future, it is going to be desirable to convert to renewable energy for environmental reasons alone,” said Brackley. “But most of the material used in wood energy comes from byproducts of the forest products industry. It works great in the lower 48 where you have roads and infrastructure. Alaska doesn’t have a huge forest products industry. When you look at harvesting wood on a remote island like we have in Southeast, if you think you want to try to use the small trees that were thinned or other harvest waste, the economics are very complex and expensive.”

The difficult economic history of the timber industry still casts a shadow for wood energy options. Dave Nicholls, the forest products technologist, explained, “The problem is that there are just a few small sawmills here that produce higher-value products, which means a limited amount of

wood for bioenergy products. This in turn means it is challenging for a biofuels producer, for example a pellet mill, to become established at a commercial scale.”

The current state of wood energy in Alaska reflects these challenges. Wood energy projects have sprouted up in about two dozen scattered locations where fuel supply and start-up funding have made them possible. This decentralized approach is proving to be difficult to institutionalize. The projects that have successfully launched provide useful learning opportunities as case studies, but have so far failed to provide a roadmap for commercialization at a scale that truly addresses broader statewide goals of energy independence.



Dan Bihn

The federal building in Ketchikan, Alaska. The white structure in the lower right is a wood pellet storage silo for the wood heating system. The difficult economic history of the timber industry in Alaska casts a shadow for wood energy options. “With few sawmills, there is a limited amount of wood for bioenergy products,” said Forest Service scientist David Nicholls. A small boutique pellet mill in Ketchikan operating out of a higher-value milling operation supplies pellets to the Ketchikan Federal Building but does not sell them retail.

The Alaska Energy Authority (AEA) is working to improve this situation. Created in 1976 by the state legislature, AEA’s purpose is to reduce the cost of energy in Alaska by financing and operating renewable projects using local resources. Devany Plentovich is a biomass project manager with AEA and helps oversee a grant that helps groups explore the feasibility of community heating projects that convert to wood-fired systems.

“Interest continues to grow,” she said. “We have funded over 100 preliminary feasibility studies so far. We have a rigorous scoring process that we rank applications by. Then we send a consultant out to the community to assess local needs and help them fit the technology to the community.”



David Nicholls

About 120 people, mostly Alaska Natives, live in the village of Gulkana, an early adopter of modern wood energy technology. Here, a small district heating system serves several community facilities with funding from the Alaska Energy Authority's Renewable Energy Fund and a USDA Forest Service grant.

Fitting the technology to the community means taking into consideration social, cultural, and even political concerns that might hinder the switch to an alternative energy source. In addition to securing a supply of wood fuel, land use restrictions, regulatory requirements, aesthetic concerns, and environmental issues could influence development of a wood energy project, or increase its cost.

For some communities, air quality is an environmental concern. "Parts of Fairbanks are noncompliant with

Fitting the technology to the community means taking into consideration social, cultural, and even political concerns that might hinder the switch to an alternative energy source.

Environmental Protection Agency air quality standards for fine particulate matter," said Plentovich. "They have a lot of outdoor wood boilers, which are poor burning appliances, and they are also using coal." Juneau also has air quality concerns, as it comes very close to exceeding the EPA's health-based standard for fine particulate matter. Local emissions of fine particulates come from all types of combustion activities (motor vehicles, power plants, wood burning), and can pose a human health risk.

Although wood energy still relies on combustion, Plentovich pointed out that the design of wood-burning systems has greatly improved over the years. "The AEA only funds the best available technology, which means EPA-certified high-energy, low-emissions appliances. These are a much better alternative than low-performance outdoor wood boilers in terms of emissions."

So far AEA has helped get several dozen wood energy projects off the ground, beginning in 2010 when it helped the Sealaska Corporation install a large-scale pellet boiler at its headquarters in Juneau. That same year, the Tok School installed a chip-fired boiler that replaces approximately 65,000 gallons of fuel oil annually.



Dan Bihn

An outdoor incinerator in Tok, Alaska. Air quality is a concern in some communities in Alaska. The Alaska Energy Authority only funds the best available technology that provides a better alternative to low-performance outdoor appliances in terms of emissions.

Other wood-fired boilers have been installed in Coffman Cove, Craig, Dot Lake, Gulkana, Kasilof, and Tanana, and over 40 projects in other communities are being considered.

The Tlingit-Haida Regional Housing Authority is one of many agencies that has benefited from AEA support. In Juneau, they devised a resourceful plan to piggyback on the Sealaska Corporation's conversion to a pellet-heating system and had one of their own put in last year to heat the warehouse where they store all their construction equipment. Craig Moore explained how Sealaska paved the way for them. "Sealaska heats their big multistory building with pellets. They have a delivery truck to bring their pellets and fill their silo. So it was a natural for us to get pellets from the same delivery system," said Moore. "It's working great."

While his job keeps him focused on helping individual families, Moore believes that the big, community-level heating projects like these are what will help shift momentum and eventually make it easier for individuals to convert to wood energy. "The big facilities are going to drive the supply system. I am proposing a district heating system in Angoon for nine buildings. I will need to figure out how to supply them. But once the big systems like these are in place, this will create a market for people supplying pellets. And once that happens I think it will start to open the door for pellet heating on the smaller scale."

Brackley concurs with this concept. "As market penetration of pellets increases and vendors become available, it will be possible to create a delivery system that is very similar to liquid fuel oil," he said. He added a note of caution: "To get to that point, however, a lot of modifications have to be made to existing homes or new homes must be built with that are designed to use automated pellet systems."

In Juneau, in addition to the Sealaska Corporation headquarters and THRHA warehouse, the Sealaska Heritage Institute-Walter Soboleff building and the City of Juneau have discussed plans to install identical systems.

➤ *Near Delta Junction, Alaska. In theory, the concept of wood energy is simple. People have used wood for heat for thousands of years. But even though Alaska has vast forest resources, only about 9 percent of the state is capable of producing a commercial crop of trees. Wood fuel can come from other forest areas, but it is very expensive.*

A Resource to Help Communities Make Energy Decisions

ALONG WITH collaborators, Bob Deering has contributed his knowledge about wood energy technology to the development of a user-friendly resource for individuals, businesses, and communities in Alaska who are considering a conversion of their facilities to wood heating. The **Community Biomass Handbook, Volume 2: Alaska, Where Woody Biomass Can Work** provides a source of reference materials, answers preliminary project development questions, and identifies proven wood-energy technologies that could be used in Alaska. It includes a financial application that allows users to conduct an initial assessment of project feasibility, quickly estimate biomass heating options, and calculate the capital investment and fuel cost savings associated with them. Developed in collaboration with the USDA Forest Service, Pacific Northwest Research Station; the University of Minnesota; and USDA Forest Service, Region 10, it is tailored for local businesses, tribal planners, community organizations, school districts, and forest management agencies.



Galena's Boarding School

GALENA IS A REMOTE rural village on the bank of the Yukon River in interior Alaska. During WWII, planes flew from a U.S. Air Force base here to Siberia to supply aid to the Soviet Union. The Air Force has since abandoned the base, but left its buildings to the town of 500 people. The base is now the site of the Galena Interior Learning Academy, Alaska's longest-operating vocational boarding school. Home to over 100 high school students representing 80 villages from all over the state, the school uses the former military buildings as classrooms and living quarters. The student body is 90 percent Alaska Native.

In 2009, the school sponsored a rural energy conference that brought statewide attention to rural energy needs. The event attracted over 300 participants and stirred up tremendous interest and community support. One result of the two-day event was the idea for installing a wood-fired boiler to heat the boarding school. Phil Koontz, a civil engineer, works for the Loudon Tribal Council, which shares governance of Galena with the city and the school. "The school's heating infrastructure was old and tired," said Koontz. "When it was used by the Air Force it was burning 1 million gallons of oil a year, partly because it was inefficient. We wanted to replace the oil system with a wood heat system."

The project proposal won a grant from the Alaska Energy Authority for a prefeasibility study, and eventually won an additional grant of \$3 million for construction. The tribe, the city of Galena, and the school came together to form a public interest corporation to pool their resources to purchase equipment, hire personnel, make contracts, and harvest trees to support a local wood fuel economy.

"People recognize the virtue of using our own resources because of how much diesel costs. Diesel generators are

Phil Koontz



The Galena Interior Learning Academy in Galena, a remote rural village on the Yukon River. Over 100 high school students from 80 villages attend this boarding school. The school's inefficient diesel heating system is being replaced by a wood-fired boiler that will use wood chips sourced from regional tribal corporation land. The city of Galena, the local tribal council, and the school came together to pool resources and support this project.

the primary source of heat here, and all the diesel comes in by barge. That's a million gallons a year barged in, then pumped to a pipeline, then stored. And not all the storage facilities are well-maintained," said Koontz.

The wood-fired boiler at the Galena school will use wood chips from cottonwood, aspen, and similar quick-growing species cut from nearby land owned by Gana-A'Yoo, a regional tribal corporation representing four villages. "Once cut, cottonwood regenerates itself," said Koontz. "Also no one really values it for firewood or other timber uses. So we have public acceptance for using it for chips, since we aren't threatening other interests."

Firewood is prized in Galena. "People do try to heat their homes with wood," said Koontz. "But Gana-A'Yoo owns most of the forest around here and they don't have a mechanism for providing permits. So they don't allow firewood harvest. The options for getting wood are limited to getting driftwood from the river or getting on your snow-go and going a long way to gather wood." And a snow-go (snowmobile) requires gasoline, parts, and maintenance.

As part of the agreement to heat the school using local wood, harvesters will set aside prized firewood species like spruce or birch when they encounter it, and will process and stack it separately to sell to local residents. "Providing a local firewood economy is a big issue," said Koontz.

The wood energy system will go online a year from now at the Galena boarding school, keeping students warm using local trees and local labor. A wood boiler won't solve all the problems facing an isolated village in a harsh climate, but Koontz recognizes that there is no perfect solution. "Wood energy is a stopgap, but it's a step we need to take," he said. ❧



Phil Koontz

The diesel boilers that heated the Galena Interior Learning Academy once burned 1 million gallons of oil a year. This fuel had to be barged in, pumped into a pipeline, and stored, incurring transportation expense and the risk of environmental contamination.



Southeast Alaska forests represent an abundance source of woody biomass. The Forest Service is conducting feasibility studies on government facilities in Southeast to pilot technologies for conversion to wood energy and to assist communities with generating market demand for regionally sourced biomass products.

Southeast Alaska's 30-Percent Goal

One factor that could nudge wood energy forward in Alaska is a state or national energy policy that would provide incentives for switching from fossil fuels. Alaska is one of 13 states without a renewable energy portfolio, a policy mechanism designed to encourage renewable energy by requiring electricity producers to supply a certain percentage of their power through renewable sources like biomass or hydropower. Additionally, most renewable energy portfolios emphasize electricity generation and neglect to recognize thermal energy sources.

Without the clout of an energy policy, Bob Deering has spent the past few years finding other ways to make it easier for facilities to find the support and information they need to install wood heating systems. He has worked to connect agencies and organizations and create a strategy for expanding the use of biomass in Alaska. Collaboration can bring resources together, but comes with its own set of complicating goals, timelines, and power struggles. Right now it appears that the future for wood energy in Alaska will be a function of costs associated with converting and the price of alternative fuels.

Other government initiatives are also contributing to Alaska's renewable energy future. Deering has been

working with the Tongass National Forest and USDA Rural Development, for example. "One of the Tongass's priorities is to promote economic development and address climate change by shifting the economies of Southeast communities from heating with fossil fuels to heating with wood energy, especially if it can be regionally sourced," said Deering.

The renewable energy assessment commissioned by the state recommended a goal of 30-percent conversion of fossil fuel heating to wood heat in southeast Alaska in the next decade. The Forest Service, USDA Rural Development, Alaska Division of Forestry, and Alaska Energy Authority also made it a goal to support that target. The Forest Service sees wood energy as a component of sustainable management of the two national forests in the state, the Tongass and the Chugach, both of which are in Southeast. "The woody biomass found in abundance in southeast Alaska represents a significant energy resource for local communities," said Deering. In August 2013, Senator Lisa Murkowski and Forest Service Chief Tom Tidwell traveled to Ketchikan to highlight two large grants awarded to local wood energy projects that will use timber from the Tongass National Forest. 🌲

The Old and the New

THE EXPERIENCE OF tending a campfire conveys the requirements of wood energy. The farther you have to go to collect wood, the more work and time it costs. The wetter your wood, the more smoke it produces. Someone needs to tend the fire if you don't want it to go out. It all comes down to costs, transportation, fuel quantity and combustion efficiency, and labor inputs.

In theory, the concept of wood energy is simple. All it really means is changing from fossil biomass to "surface" biomass, and in some respects it tries to bring society full circle. In 2000, wood was the primary fuel for home heating in only about 4 percent of Alaska households. In 1950 it was 22 percent. In other words, burning wood is not a new technology, even if the appliances are. As Cassie Pinkel describes it, "I don't call it 'converting' to wood heat, I call it 'reverting.' It's what people did for thousands of years. Now it's just a matter of switching to wood as your primary heat source, as more and more people are doing as oil prices have increased."

Craig Moore agrees that heating with wood is nothing new. But the times have changed, he cautioned. "Back when everyone heated with wood, people spent all day every day working to get food and keep warm. People don't have the time and energy to subsist like that anymore. We're used to having something automatic. It's also a challenge now to get

"I don't call it 'converting' to wood heat, I call it 'reverting.' It's what people did for thousands of years."

the firewood, to get the permission from whichever landowner. Now you might have to own a truck. Trucks cost money. So do chain saws. And the modern reality is also that a lot of the land is off limits, with no logging roads, no way to get your wood." Alaska has a vast amount of forest land, but only about 9 percent of it is commercial forest and capable of producing a commercial crop of trees. Wood fuel can come from other forest areas, but it is very expensive.

In Alaska, many of the usual barriers to adopting new energy technologies are amplified by the sheer size and diversity of the land, varying climates, extreme weather, and distance from global demand centers. The transportation costs that exacerbate heating oil prices in remote village cause the same problem whether the fuel is diesel or

wood pellets, for example.

As Allen Brackley put it, "With any new technology, you always come up against the unique characteristics of doing business in Alaska. With wood energy we're making good progress, but it's very slow. It's all in your definition. If you look at a community like Craig, they put a wood-fired boiler in their school. This project represents an opportunity for them to save \$100,000 a year in fuel costs. If you can free up that type of money and use it for educating children, that's progress." 🌲



Dan Bihn

A bulk pellet delivery truck owned by Superior Pellets. In Alaska, many of the usual barriers to adopting new energy technologies are amplified by the sheer size and diversity of the land, extreme weather, and distance from global demand centers. The transportation costs that exacerbate heating oil prices in remote villages cause the same problem whether the fuel is diesel or wood pellets.



Dan Bihn

A student at the Thorne Bay School, South Island School District, Alaska. Cordwood boilers heat the school and an adjacent greenhouse. Students help collect cordwood, feed the boiler, and sell vegetables from the greenhouse to local restaurants. “If you can save money in fuel costs and use that to educate children, that’s progress,” said Forest Service scientist Allen Brackley.

The Thorne Bay School

DEVANY PLENTOVICH of the Alaska Energy Authority has seen a lot of wood energy project proposals and witnessed many of them successfully launch. But one in particular stands out. “The Thorne Bay School project just makes me happy,” she said.

For over a year, Thorne Bay has heated its elementary school with two cordwood boilers. The town of 500 people sits on Prince of Wales Island in southeast Alaska, surrounded by a forest renowned in the 1960s and 1970s for hosting the largest logging camp in North America. Their plans to switch to wood boilers in 2012 experienced a slight setback as they waited for their wood storage facility to be completed. Being careful about storage makes a big difference in southeast Alaska, which can receive up to 200 inches of rain a year. Burning wet wood leads to higher emissions, lower efficiency, and more boiler maintenance. So the school opted to wait and let their wood supply dry for a year and brought the boiler online in 2013.

The Thorne Bay school boilers burn about 200 cords of wood a year, replacing more than 20,000 gallons of heating oil. Most of the cordwood comes from the leftovers on timber cuts around the island.

“What’s so great about it is that the school district integrated the boiler into the school curriculum,” said Plentovich.

“The school bought a greenhouse that is heated by the wood boilers. Now they have a salad bar at their school, and even grow extra vegetables. They sell lettuce to restaurants, and students are learning to be entrepreneurs and run a business. In the summer months, the kids take over the whole enterprise.” Other learning opportunities were sparked when the school challenged students to come up with storage designs. The kids created new ideas for pallets and cribs for stacking the cordwood.

The school district also avidly promotes archery, and has produced most of Alaska’s top archery competitors in the past few years, some of whom have even taken national honors. They found a way to tie their archery program to the wood heat project. As Thorne Bay parents and kids travel the region attending archery competitions, they also volunteer to deliver cordwood back home, saving the school on transport costs one carload at a time.

In this town, the use of wood to heat their school seems to fit like a glove. “They aren’t saving money yet over fuel oil,” said Plentovich. “But all the money they do spend is now staying in the community.” The school district has exported the Thorne Bay model, systematically converting several other schools to wood heat with a corresponding greenhouse. 🌱



PRSR STD
US POSTAGE
PAID
PORTLAND OR
PERMIT N0 G-40

U.S. Department of Agriculture
Pacific Northwest Research Station
1220 SW Third Avenue, Suite 1400
P.O. Box 3890
Portland, OR 97208-3890

Official Business
Penalty for Private Use, \$300

S U M M A R Y

A severe climate, high transportation costs, and limited infrastructure have led to high energy costs in many places in Alaska, particularly in remote villages. Some communities are seeking opportunities to convert oil and electrical heat to a renewable energy source such as woody biomass. There are different types of wood energy appliances and fuel sources, and finding the right fit requires assessing local needs and tailoring the technology to the community. There are still serious barriers to adopting new energy technologies in Alaska. However, some projects have been successful and can serve as models for other communities.

For More Information

Brackley, A.M.; Barber, V.A.; Pinkel, C. 2010. Developing estimates of potential demand for renewable wood energy products in Alaska. Gen. Tech. Rep. PNW-GTR-827. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 31 p.

Nicholls, D.L. 2009. Wood energy in Alaska—case study evaluations of selected facilities. Gen. Tech. Rep. PNW-GTR-793. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 33 p.

Contacts

Robert Deering, former Southeast Alaska biomass coordinator, USDA Forest Service Region 10. rcdeering@gmail.com

Allen Brackley, research forester, Pacific Northwest Research Station. abrackley@fs.fed.us

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.