Alaska – 40 Articles

Document 1

Invest in renewable energy

* Molly McDermott Fairbanks
* Feb 10, 2016

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**News-Miner letter to the editor:**

Feb. 1, 2016

**To the editor:** Gov. Bill Walker’s budget proposal illustrates the growing realization that Alaska must diversify our economy to have a stable financial future. As such a large and rural state, we have unique energy challenges, but also the opportunity to take advantage of a rich array of renewable resources including wind, hydro, solar and geothermal.

We cannot afford to provide tax credits to oil companies. Instead, we can incentivize the transition to a diverse energy economy with a carbon fee and dividend, which is a market-based solution that penalizes carbon-producers and provides private households with additional income. By implementing a carbon tax, British Columbia has reduced their emissions by 16 percent and maintained a healthier economy than much of Canada. Kodiak and Sitka are almost entirely powered by renewables and have lowered their energy costs and improved quality of life as a result. Let’s lead the nation in developing renewable technology solutions for our energy needs and transition from a fossil-fuel based economy.

Document 2

Electrify highway with renewable energy

* J.P. Pinard Whitehorse, Yukon Territory
* Oct 11, 2015

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Letter to the editor

Oct. 8, 2015

**To the editor:** My wife, Sally Wright, and I traveled by SmartCar to Fairbanks last week to attend the Arctic Energy Summit. It was a meeting on energy related to the Arctic and it informs the Arctic Council.

The conference was very informative on issues that are facing the Arctic with the push for extracting more polluting fossil fuel to feed their economies and our need to stop runaway climate change. Next April, Fairbanks will host the Alaska Rural Energy Conference, and we’d like to see more Yukoners join us to learn about the energy challenges and solutions in Alaska.

As we drove home from Alaska, we ruminated about how wonderful it would be to drive an electric car back to Fairbanks. Over the day’s drive, we strategized about how to electrify the Alaska Highway and fuel its communities along the way with renewable energy.

For us to use that electric car, we would need an EV charging station in every highway lodge and community from the Yukon to Alaska. We want all of those communities to be able to produce renewable energy, store it, use it and sell it to us to recharge our car.

These communities would build resilience through energy efficient homes and businesses. Energy storage systems would protect the community from rising fossil fuel costs.

As these communities thrive and grow, the local grid could then be expanded to other renewable energy projects along the highway. Eventually, most of these small communities will be able to connect to each other and start selling renewable electricity to each other’s markets. This new energy infrastructure can spread all over the world and we could become leaders in building this new economy.

The inspiration we received from the Arctic Energy Summit is just one hopeful consequence of the un-muzzling of scientists. With our federal election near, we want our fellow Canadians to understand there are good solutions and a vibrant economy awaiting us as we shrug off our addiction to fossil fuels.

Our brightest minds are working to solve these problems. Voters need to step up and help us achieve a better future for our children and vote for the person who shows diplomacy and will work across party lines to save our precious home, Earth.

There is no Planet B. Only together, can we achieve a better future for our children.

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Alaska needs to move to renewable energy

* Robert Shields
* Dec 12, 2017

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FAIRBANKS — We desperately need a paradigm shift regarding our attitude toward energy in this state. While the rest of the world is rapidly shifting to clean abundant renewables we are, once again (see the Healy Unit 2 power plant), burdening at least the next two generation of Alaskans with debt and dependence-anchors to the past. As ground zero for the global effects of a rapidly changing climate, we have an opportunity to plant the seeds of change by embracing the merits of a clean energy economy. Recognizing the multitude of benefits that come along with decentralized microgrids, stabilized by a combination of clean technologies such as wind, solar and biofuels translates into lower energy cost, job creation and improved air quality. Using the same pipes laid for natural gas, we can eliminate organic waste in every community in Alaska by digesting it to produce power (including transportation) and as a by-product, get soil for the garden. Then, there is geothermal and microhydro to consider as sources. The list goes on regarding the abundance of technologies that provide alternatives to the short-sighted investment into the dinosaur economy, and I have confidence that in making a transition no one will freeze.

In one hour, the sun generates enough power to run our entire civilization for a year. Alaska has the resources to draw power 10 months out of the year and the technology to comfortably meet at least half of our electrical and heating needs annually. If we just took a bite of this low-hanging fruit it would change the entire dynamic in Alaska and finally provide the jobs, clean air and affordable energy we keep getting promised. What Germany, a world leader in solar energy, and many other countries have that we currently lack is the political will to put real limits on the companies using lobbyist to write law, buy representatives and make their profiteering legal at the cost of the community and the planet. An oil ex-executive as the head of the Environmental Protection Agency is a perfect example of how fools multiply when wise men stay silent.

Fortunately, the economic climate is also shifting. GE just announced they are cutting 12,000 jobs from their energy sector because the demand for coal and natural gas just isn’t there. At the same time, according to a CNN article, the clean energy economy is growing 17 times faster than the rest of the economy combined with a sustained growth rate of 24 percent. It’s expected this industry will add more than 24 million jobs by 2030. In defiance of Trump, both Anchorage and Fairbanks mayors have pledged to support the Paris climate accords. The cost of solar technology has dropped more than 50 percent in just the past five years. In addition, financial institutes, like Denali Federal Credit Union, are now offering financing for residential solar panels. Harnessed for the millennium, sunlight is free.

For the past six years I have organized the annual solar tour, which had a record 12 sites this season. With 165 systems tied into the Golden Valley Electric Association grid, it is clear solar works in Alaska. When companies like Giant Tire and HooDoo Brewery convert, you know the industry is primed to go mainstream. Earlier this year, I managed to convince some local groups to go after the Department of Energy SunShot challenge, which is a national competition with prizes totalling $5 million for communities who can develop models for financing community solar projects; projects that specifically meet the needs of under served populations. As a result, we got $10,000 in technical vouchers, the borough is now seriously looking (after five years of advocacy) at solar for schools. I have been working on a presentation to instigate solar projects with local churches as a forerunner to strive for energy independence for every corner of the state.

Historically, Alaska is known as an oil state. Just like the U.S., historically, was known for the slave trade. When we came together and mustered the political courage to abolish slavery we thrived. While no system is perfect, most would agree we are in a much better place. The same is true of making the just transition from drilling for dinosaurs to harnessing the free, clean and abundant energy from the natural world all around us. When we let go of the past, the future becomes clear. With an aerospace university, extreme environmental conditions and hundreds of isolated communities we could thrive as a STEM (science, technology, engineering and math education) state, helping Elon Musk win the race to Mars.

*Robert Shields lives in Fairbanks and is the founder of the Alliance for Reason and Knowledge.*

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Murkowski must lead on renewable energy

* Mar 26, 2016

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**Fairbanks Daily News-Miner letter to the editor:**

March 25, 2016

**To the editor:**Alaska’s fiscal and economic crisis, as well the impacts of our warming climate are two topics grabbing headlines in Alaska on a daily basis. On Monday at 1 p.m. in the Fairbanks Pipeline Training Center, Sen. Lisa Murkowski will be holding a field hearing for the U.S. Senate Committee on Energy and Natural Resources. The topic of the hearing is “Expanding Alaska Resource Development — Opportunities to Create Jobs and Strengthen National Security.”

Conspicuously missing from the list of invited witnesses is anyone who will advocate for the development of Alaska’s vast renewable resources. As chairman of the Committee, Sen. Murkowski has instead selected witnesses with ties that represent to the extractive industries. These witnesses will undoubtedly call for doubling down on the fossil fuel dependency that has caused the economic and environmental downturns that Alaskans are yearning to escape from.

The development and deployment of renewable energy sources, on the other hand, is precisely what will be necessary in the years ahead to diversify Alaska’s economy, offer Alaskans true independence from the volatile price swings of fossil fuels and prevent dangerous climate change that is already damaging our state’s vulnerable landscapes, oceans, ecosystems, infrastructure and communities. Many economists, scientists, community leaders, faith-based organizations and residents throughout Alaska have been advocating for such a transition.

These are the stakeholders from Fairbanks and across Alaska that the Senate committee needs to hear from. Last month, Sen. Murkowski hosted another field hearing in Bethel that highlighted the development of renewable innovations in rural villages, and she should be commended for her leadership on that issue. But renewables are not just a niche innovation being used to power micro-girds in Alaska’s rural villages.

Renewables must be the foundation of a new energy system that powers all of Alaska, the United States and the rest of the world without emitting carbon pollution. Alaska needs Murkowski to lead on legislation that diversifies our economy, stimulates a just transition to renewables and protects our climate. The upcoming hearing appears set on accomplishing just the opposite.

Andrew McDonnell and Jessica Girard

Fairbanks

Document 5

Renewable Energy Fair looks to the future

* By Jeff Richardson jrichardson@newsminer.com
* Aug 17, 2015

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FAIRBANKS — A decade after the first Renewable Energy Fair was held at Chena Hot Springs Resort, the annual event has become a magnet for politicians, scientists and innovators.

The fair trumpets advances in renewable energy, with a backdrop of the geothermal-powered resort at the end of Chena Hot Springs Road. Presentations on LED lighting, hydrogen energy and more were held during a series of sessions during a drizzly Sunday.

This year hundreds of spectators browsed through the area, listening to speakers that included Gov. Bill Walker, Sen. Dan Sullivan and Fairbanks North Star Borough Mayor Luke Hopkins. Sen. Lisa Murkowski, who planned to attend, canceled due to a family matter.

Chena Hot Springs Resort owner Bernie Karl, who serves as a high-volume emcee for the event, said he launched it with a simple goal.

“All I envisioned was sharing knowledge,” he said. “If you keep knowledge, what good is it?”

Karl said he’s on a continuing search for energy solutions in the North, particularly Alaska. One booth included a massive tub of compressed recycled paper, which Karl’s other business, K&K Recycling, burns to generate electricity. Other displays included compressed wooden logs, advances in cold-weather building designs and geothermal technology.

“This is a place where it’s very clear that ideas matter, people matter, innovations matter,” Sullivan said.

Karl used this year’s fair to introduce keynote speaker Stefan Larsson-Mastonstrale, the chairman of the Swedish company Insresol. The company is developing a “personal power plant” roughly the size of an end table that it views as the eventual replacement for large-scale energy projects.

Its inventors claim the device uses a new type of external-combustion engine to convert solar, biomass or other energy types into a self-contained heat and power plant. Not only will it allow people to save on their utility bills, they say, but will allow them to sell excess electricity to their local utilities.

Larsson-Mastonstrale said the flow of that electricity through the Internet will allow people to create a virtual grid, eliminating the need for massive energy plants. A network of 250,000 users reportedly makes enough energy to replace a nuclear power plant.

Karl said he’s toured the Swedish factory where the generators are made and convinced Larsson-Mastonstrale to unveil it to the public at the fair.

“It’s going to change energy,” he said. “It’s going to change the way we live in the Arctic in the future.”

Such optimism has become part of Karl’s trademark for the event.

Amid a state budget crunch and high energy prices in much of Alaska, Walker said he appreciates the positive tone. He said his week included touring five remote villages — including one where the power plant was connected to hand-pumped 55-gallon oil drums — and that the contrast between problems and potential solutions is encouraging.

He said other energy projects in the state, such as a biomass-powered boiler at the Tok school, can be traced to innovations like the ones displayed at Chena Hot Springs.

“I always leave feeling much better than when I arrived,” Walker said.

Hopkins said he believes that such showcases will eventually translate into practical solutions for the state’s residents.

“We’re here to move energy from a darn good idea to a darn good solution,” Hopkins said.

Document 6

GVEA plans to add more renewable energy

* Kevin Baird kbaird@newsminer.com
* May 14, 2017

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FAIRBANKS — Golden Valley Electric Association’s generation portfolio could add more renewable energy in the next decade.

And the co-op has a big decision to make regarding the coal power plant known as Healy 1.

GVEA President and CEO Cory Borgeson briefly touched on his vision of more renewable energy in the future during the co-ops annual member meeting — mentioning an additional four turbines at GVEA’s own Eva Creek wind farm, Mike Craft’s proposed 13.5-megawatt wind farm, and the Fire Island 2 wind project. Borgeson said GVEA could be putting more batteries into the system to accommodate the increase in renewable energy.

Borgeson also announced GVEA would construct a half megawatt solar array near Fairbanks. Borgeson said the small array would be somewhat experimental in nature to see solar arrays cost effective. Borgeson said there are currently 165 solar producers on the grid and an independent power producer has been in contact with GVEA about a creating 1-megawatt solar array near Salcha.

Connecting with GVEA is relatively easy and encouraging if the renewable energy source is less than 2 megawatts, Borgeson said. He said an independent power producer that generates more than 2 megawatts will incur regulation costs.

**Healy 1**

The 28-megawatt coal plant known as Healy 1 is due for an environmental permitting upgrade in 2022, Borgeson said. If the permit and upgrade are not met, the plant would be shut down in 2024 and GVEA would lose a cheap source of energy.

“It’s a decision we have to make. We haven’t mapped it out. I would suggest it’s more than $50 million to upgrade,” Borgeson said.

Borgeson said the Healy 1 plant’s output wouldn’t doom the grid but it would be a tough loss because coal power plants from the 1960s  are lasting a long time and the plant is well maintained.

**Healy 2**

Healy 2 — the plant formerly known as the Healy Clean Coal Project — was purchased by GVEA in 2013 from the Alaska Industrial Development and Export Authority for $44 million. After repairs and upgrades the power plant went online in 2015 before an explosion took it out of commission. Healy 2 has since had another small explosion.

Borgeson said the plant is still six months to a year from coming online, but when its operational it will produce the cheapest power in the rail belt.

“The cost of power out of that plant is so low it is competitive with anything being produced by the Anchorage utilities,” Borgeson said. Borgeson plans to sell power from Healy 2 to other railbelt utilities in an effort to lower member energy rates. “We are always a buyer. When Healy unit 2 runs it would be dispatched all the time. It could be sold to the south.”

In addition, Borgeson said relationships with other railbelt utilities are at a high point, and these companies have not been so friendly in the past.

The Golden Valley Electric Association was formed in 1946. The co-op now has more than 34,000 members and serves the Interior communities stretching from Fairbanks to Delta Junction and south to Cantwell.

Document 7

Alaska has many renewable energy options

* By Matt Buxton mbuxton@newsminer.com
* Sep 28, 2015

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FAIRBANKS — For many, the options for renewable energy may seem pretty limited.

There’s solar, hydro and wind, and they each come with additional challenges in the Arctic, where winter nights are short and water tends to freeze.

But there’s plenty on the horizon that could be promising. Some of those technologies are on display this week at the Arctic Energy Summit in Fairbanks, a three-day event at the Carlson Center.

The event is hosted by the Alaska-based Institute of the North and has brought in government, industry and other experts from Arctic nations around the world to discuss energy.

One of those people was Dr. Eric Bibeau, from the University of Manitoba. He acknowledged the challenges facing energy and heat generation in the Arctic, but said his job is to come up with “the new technology to solve it.”

“The take home message I want you to leave with is that don’t think what you hear in terms of renewable energy is all you’ll have in the future,” he said. “There’s people who work very tirelessly at developing ideas and the world you move forward is going to be full of solutions.”

Bibeau focused most of his presentation on thermosiphons, a special piping system that leeches the heat out of the ground to help heat and potentially even generate power in a building.

You’ll see them on the support pillars of the trans-Alaska pipeline system or along the road. They passively suck heat out of the ground, keeping the permafrost cool and the pipeline or road stable.

Bibeau said they could be used to help cool or heat homes in the Arctic as well as keeping the ground stable. He said the idea could be adapted with the addition of a coolant like ethylene glycol to increase the heat transfer capacity. Such a system could also be used to run a refrigerator without the need to plug it in, he said.

“It’s a pipe,” he said. “All you need is a pipe, there’s nothing fancy to it.”

He also discussed innovations in biomass as well as better ways to utilize solar panels by designing a system that recognizes they’ll rarely be generating their maximum peak load.

“The future looks renewable and don’t think that one size fits all,” he said. “The oil and gas industry has trained us to be single-minded in one approach, but if you want to go renewable you better like diversity.”

Document 8

Seward to move forward with renewable energy heating project

* Associated Press
* Sep 2, 2015

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SEWARD, Alaska - The Kenai Peninsula city of Seward has voted to move away from heating oil and create a renewable energy heating district.

The Seward City Council voted Monday to move forward with a project to heat four city buildings using heat from Resurrection Bay tides, according to the Alaska Dispatch News (<http://bit.ly/1JB1mrq>).

The proposed system would use a series of heat loops that would absorb energy from sea water moving through gravel 200 to 300 feet below the city's waterfront.

Andy Baker, an Anchorage-based renewable energy consultant with his own company, YourCleanEnergy, said if built, the system would be the farthest-north ground source heat pump in the country.

The project has been around for years, especially after the Alaska SeaLife Center, an aquarium and marine mammal rehabilitation facility, successfully implemented a similar system to heat the entire building in 2012.

"This process in Seward has been very steady, slow-moving, but steady, and always going forward," Baker said Tuesday. "And that's a good model for a lot of these towns."

The council has agreed to apply for an $850,000 Alaska Energy Authority Renewables Energy Fund grant and allocated $85,000 in city general funds to make the grant competitive.

Assistant city manager Ron Long estimates heating the library, city hall, a city annex and fire department with renewable energy will save the city up to $76,000 annually.

With President Barack Obama's visit to the city just hours after the council passed the decision, Long said he wished he could highlight Seward's progress toward renewable energy and fighting climate change even further.

"I really wish I had an opportunity to say, 'Look what our city council did last night!'" he said. "But I can see how it's not possible that I would be able to have lunch with the president."

Document 9

Renewable Energy Fair offers ideas for heating and eating

* By MATT BUXTON mbuxton@newsminer.com
* Aug 19, 2013

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FAIRBANKS — The annual Renewable Energy Fair at Chena Hot Springs Resort is a place for big ideas.

Sunday’s event featured a plethora of promising projects and presentations in the fields of geothermal, wind to heat ideas, solar power, hydro power and even horse power.

But the project that was turning the most heads was the insulated shipping trailer filled with hundreds of heads of lettuce growing happily under rows of LED lights.

The system is based on years of trial-and-error in Chena Hot Springs’ year-round greenhouse, which produces lettuce and tomatoes as well as other produce.

“If we had not been successful over there, we wouldn’t even try this,” said Jeff Warner, the controlled-climate specialist at Chena Hot Springs Resort.

Warner and Chena Hot Springs have been working for years with researchers at the University of Alaska Fairbanks on perfecting the balance of lights, water, heat, humidity and air-circulation to grow plants year round.

The idea with the shipping container, which is destined for Glennallen, is that a community could employ one or more to grow produce that would otherwise be costly or impossible to ship in.

Warner said the trailers, which can be built locally and shipped throughout the state, can produce as much as 150 heads of lettuce per week.

The possibilities the unit posed turned a lot of heads, including that of U.S. Sen. Lisa Murkowski, who is a regular face at the annual event.

“It’s really very impressive what they’re doing with it,” she said. “You could feed a whole community.”

Warner said the economics of the project are still being calculated, and it’s unclear whether a trailer grow will be a cost effective source for produce in the Fairbanks supermarkets, but said it could be readily deployed to places like the flood-hit Galena.

“You’ve got to think of every square inch because it’s valuable,” he said. “If I can go buy it cheaper at the store, then I will buy it at the store.”

When asked if he could grow the hearty green kale, Warner said it’s possible but that it likely wouldn’t make economic sense because not many people like kale.

But at the end of the day, no matter what sort of indoor growing operation is built, whether it’s in a trailer or a warehouse, it will require knowledgeable hard-working people to operate it.

Anything from incorrect water pH, to a door left open too long or even cigarettes tainted with tobacco mosaic virus could wipe out an entire crop in moments.

“Our objective is to provide a nice, stable system that can be operated by knowledgeable people,” he said. “I can build the Taj Mahal of hydroponic systems, but they can put the wrong kind of gas in the tank and everything will die.”

Luckily, though, a lot of those mistakes have been made at the Chena Hot Springs Resort’s greenhouses, which he says are the testing bed to prove that indoor growing can work in Alaska.

“The idea is to make the mistakes so you don’t have to,” he said. “We just keep replanting.”

Document 10

House votes to extend renewable energy grant funding

* By Fairbanks Daily News-Miner
* Mar 19, 2012

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House votes to extend renewable energy funding

— Posted by Matt Buxton, staff writer

The House unanimously passed a five-year extension of a state grant program to develop renewable energy projects on Monday.

House Bill 250, sponsored by Rep. Bill Thomas, would reauthorize the Alaska Energy Authority’s Renewable Energy Grant Fund through 2018.

The fund spends up to $50 million a year on renewable energy projects aimed at getting the state off fossil fuels. The fund was created in 2008 and has had 21 projects come online as of January.

The funded projects cover a wide array of types, including biomass, solar, wind, hydro, geothermal and heat recovery. In Fairbanks, the grant program has paid for a [North Pole biomass power plant](http://www.newsminer.com/bookmark/16740783-Recycling-center-owner-Bernie-Karl-will-burn-paper-to-generate-electricity) — run by the Bernie Karl-owned K and K Recycling — and a heat recovery system, which when combined displace an estimated 309,00 gallons of diesel fuel a year.

It’s also funded the Tok School wood-fired boiler and the Delta wind project.

The bill heads to the Senate next.

Document 11

In rural Alaska, Obama works to speed renewable energy revolution

* Juliet Eilperin The Washington Post
* Sep 2, 2015

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KOTZEBUE, Alaska - The White House announced Wednesday that it would launch a $4 million initiative to speed the development of renewable energy in remote Alaskan communities, part of a package of new programs aimed at reducing fossil fuel use and countering climate impacts in the region of the world that is warming the fastest.

The issue of high-cost energy is an acute one in this area of Alaska, where shipping in diesel and gas by barge means residents pay far more to power their homes and run their vehicles than Americans in the lower 48.

Vernon Adams Sr., vice chair of the tribal government council in the small village of Noatak, said the enormous transportation costs made it imperative they figure out new ways to cut fuel costs.

"We'd like all the help we can get to get our fuel in a safe manner and enjoy a little of our spending money, rather than spending it on the high cost of fuel," Adams said.

Alaskans paid an average price of 18.12 cents per kilowatt hour of electricity in 2013, according to federal data - second only to New York and Hawaii - but in this part of Alaska, residents pay at least 40 cents a kilowatt hour, even after receiving a state subsidy aimed at making energy costs more equitable across Alaska.

The renewable energy funding was one of several initiatives the administration unveiled Wednesday under the umbrella of helping tribal and rural communities cope with climate change and other challenges. White House officials said the Denali Commission, an independent federal agency since 1998, would serve as the federal coordinator for building climate resilience in rural Alaska, and would provide $2 million to support voluntary relocation efforts for vulnerable villages.

The Agricultural Department said Wednesday that it will provide $17.6 million to bolster health operations in more than a dozen communities, as well as $240,000 to improve water and sewage treatment operations in rural Alaska.

White House senior adviser Brian Deese told reporters the administration was committed to protecting tribal members' way of life.

"Alaskan Natives have been living in this land and with this way of life for thousands of years. These traditions and ways of live are ... important to our country, important to the state and they are Americans," Deese said, adding that officials are working to determine "because of changes in climate, what can we do to make sure that these traditions and way of life are not lost forever."

Still, several tribal leaders who gathered in Kotzebue, which will be the last stop on President Barack Obama's three-day tour of Alaska, said they expected more from the federal government given the peril their communities now face.

Kivalina tribal government council President Millie Hawley, whose 400-person town stretches eight miles along a gravel spit, has sought federal funding for both an evacuation road and a complete relocation of the village. She noted that in 2004, the town lost at least 70 feet from the side that borders the Chukchi Sea, and changing weather has made the resources villagers depend on less predictable.

Moving to a major city or different area in Alaska, Hawley said, would devastate the community. "You're asking us to not be a people anymore," she said. "The land and the resources of our land make us a people."

A total relocation of Buckland would cost roughly $100 million; even building the evacuation road would cost roughly $15 million.

Percy Ballot, tribal government council president of Buckland, said of the $2 million funding announcement: "We appreciate that, we really do, but we're going to need more money than that. ... If you could, please, pass the message on."

Sen. Lisa Murkowski, R-Alaska, noted in an interview that the president has pledged to provide $3 billion to help people in developing countries overseas cope with climate impacts, but rural Alaskans face many of the same challenges..

In some places, "there is no running water, there are no sanitation facilities. That puts you in Third World status," Murkowski said. "He's willing to pledge the money for developing countries. But there's a saying that charity begins at home. We don't want to forget."

Still, Kotzebue is also a model for how rural communities can chart a new energy trajectory. In this small town 32 miles north of the Arctic Circle, officials have begun a major effort to cut their use of high-cost diesel by launching wind and solar projects.

The Kotzebue Electric Association has established 19 wind turbine towers, each 250 feet tall, roughly four miles from town. They now provide 20 percent of Kotzebue's electricity and save it 250,000 gallons of diesel fuel a year. The association also manages wind projects for neighboring communities: Buckland dedicated two 100-kilowatt turbines in August, and Deering will be commissioning a 100-kilowatt turbine in October.

"We are very pleased to see the president's focus on rural energy solutions," said Brad Reeve, the association's general manager. "Accelerating Rural Alaska's integration of renewable energy sources like wind and solar will increase the sustainability of all Arctic communities."

The Northwest Arctic Borough, which helps govern not just Kotzebue but also 10 smaller surrounding communities, has also provided a grant to expand solar power in the region and to help run their water and sewer services. The grant has established a 20-KW project in Kotzebue and 10-KW solar projects in nine of the surrounding villages.

Microgrids proliferate in Alaska because its rural communities are so far-flung. Alaska boasts more than 200 of them, according to Navigant Research, more than any other state. But diesel energy remains dominant: Only 70 of the microgrids have renewable power as part of their supply.

"Isolated Alaskan villages provide a perfect template for developing practical, "smart" renewable energy systems than can largely replace dirty, expensive diesel power," said David Hayes, who helped lead the Interior Department's Arctic strategy as deputy secretary during Obama's first term and is now a visiting law professor at Stanford University. "Marshaling U.S. technology to develop lower-cost, replicable, small-scale systems could dramatically improve the quality of life for villagers in Alaska and around the world."

Before heading to Kotzebue, Obama traveled to Dillingham in southwest Alaska, where he met with fishing operators and spoke of the need to protect the world's largest sockeye salmon fishery. Noting that he had barred oil and gas production in the region's Bristol Bay, he said it "represents not just a critical way of life that has to be preserved, but it also represents one of the most important natural resources that the United States has."

"And by the way, that fish jerky, outstanding," he said, prompting laughter. "So I strongly recommend it."

Document 12

Susitna-Watana dam project draws attention to renewable energy goal

* Becky Bohrer / Associated Press
* Feb 17, 2014

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JUNEAU, Alaska - In 2010, the state adopted an energy policy that, among other things, set a goal of having 50 percent Alaska's electric generation come from renewable and alternative energy sources by 2025.

The likeliest way to reach the goal is widely believed to include a major project in south-central Alaska, the proposed Susitna-Watana hydro complex. But the project, which critics see as unnecessary with the state pursuing a natural gas pipeline, is far from assured.

Rep. Bill Stoltze, R-Chugiak, vented his frustration during a House Finance Committee hearing last week, saying the state should stop talking about the goal because he didn't see a commitment to it from Gov. Sean Parnell's administration. Stoltze later said his comments were more of a political challenge, borne of a desire to have a more open discussion on projects - to know, for example, what impact one project, like a gas line, could have on another, like Susitna.

"If we can't juggle two things at once, let the public know," he said.

Parnell spokeswoman Sharon Leighow said the state remains committed to the renewable-energy goal as demonstrated by investments in and ongoing work on the Susitna project and other hydro and wind projects across Alaska. Parnell included $10 million in next year's budget for the project.

The governor said earlier this month that he had no basis to ask legislators for more money until the Alaska Energy Authority (AEA), which is behind the Susitna project, had made substantial progress toward or completed land-access agreements.

AEA spokeswoman Emily Ford said the authority is currently negotiating land-access permits and hoped to soon have a signed permit to conduct environmental field work.

The authority had sought $110 million to complete its initial study report and prepare its license application for the Federal Energy Regulatory Commission during the upcoming fiscal year. It requested and received more time to file its report, which was initially due Feb. 3.

In recent years, the state has provided more than $170 million toward the project. With projections calling for slumping revenues and the state facing the prospect of using savings to get by, some lawmakers - like Stoltze's House Finance co-chair, Alan Austerman - have called for taking a tough look at projects and deciding if they are the best places for continued investment.

House Speaker Mike Chenault told a news conference last month he believes that both Susitna and the gas line are needed to meet Alaska's future energy requirements. He called the money being spent now lead-up money, going toward work that will help the state decide whether the projects are viable and worth pursuing.

Rep. Craig Johnson, R-Anchorage, noted that the lead-up phase isn't cheap. "But I don't think that we want to advance the project without going through the due process, and that's not an inexpensive process," he said.

Critics of the project worry about the impact the dam could have on things like salmon and river levels and flow. They fear it could be vulnerable in an earthquake.

The project as proposed would be one of the tallest dams built in the U.S. in decades. Current plans call for a 735-foot dam built into the Susitna River Canyon and a reservoir that would stretch more than 40 miles. It is currently projected to cost $5.2 billion, though it is not yet clear how it might be financed.

Melis Coady, who was recently in Juneau with a group of Susitna opponents, said Susitna isn't a good fit for the energy needs of Alaska, which in parts of the Railbelt include a need for more affordable heating options. Electricity, she said, doesn't keep you warm. She worries the state backed itself into a corner with Susitna and the renewable-energy goal.

Sen. Bill Wielechowski, D-Anchorage, said he thinks Alaskans would love to get to the 50 percent goal, but he believes it would be extremely difficult without a project like Susitna. He said projects need to stand on their own and he still has questions about Susitna's impact on fisheries.

"If the project doesn't work out for whatever reason, we need to re-evaluate," he said.

Rep. Charisse Millett, who helped craft the energy policy, said she believes the renewable goal is attainable with or without Susitna. Other projects on the books through the Renewable Energy Fund can help move the state closer to that goal, she said.

"Technology is moving faster and faster every day," Millett said.

According to the 2013 Renewable Energy Atlas of Alaska, hydroelectric power supplies 20 percent of Alaska's electricity in an average water year. Wind provides less than 1 percent.

The governor's Office of Management and Budget has reported the state's renewable-energy portfolio has grown steadily since 2008.

Millett, R-Anchorage, supports the state continuing to pursue both Susitna and a gas-line project, in case one falters. Natural gas, while not renewable, is still a good form of "clean" energy, she said.

The tone of discussion has changed since her first session in 2009, she said, moving from the state doing "absolutely nothing" for energy to what the state is doing and the available options.

The issue now is money, she said.

"But we're still all working toward the same goal: sustainable, cost-efficient energy for the whole state," Millett said.

Document 13

Alaska lawmakers to speak at Chena Hot Springs Renewable Energy Fair

* By Matt Buxton/mbuxton@newsminer.com Fairbanks Daily News-Miner
* Aug 24, 2012

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FAIRBANKS – The seventh annual Chena Hot Springs Renewable Energy Fair is set for Sunday, and a number of big names are expected to take part.

Keynote speakers include Alaska Sens. Lisa Murkowski and Mark Begich; Rep. Don Young; Sen. Ron Wyden, D-Ore.; local mayors; Lt. Gov. Mead Treadwell; and Chena Hot Springs owner Bernie Karl.

This year’s theme is “Renewable is Doable.” The event will include the unveiling of new geothermal wells, which will allow the operation to move off petroleum heating. There also will be a new LED light system for the Chena Fresh All Season Greenhouse.

The event highlights the developing control over energy policy. Both Murkowski and Wyden are members of the Senate Committee on Energy and Natural Resources. Murkowski is the ranking Republican member, and Wyden is the No. 2 Democrat. The elections will determine who chairs the committee, which has oversight over multiple high-stakes energy projects.

The event includes workshops and activities relating to the renewable energy efforts at the hot springs. There are free van shuttles from the University of Alaska Fairbanks Nenana bus shelter and Tanana Valley Fairgrounds, which leave at 8:15 a.m. and 8:35 a.m., respectively.

The event is scheduled for 10 a.m. to 6 p.m.

Admission and lunch are free.

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Anchorage army base turns trash into energy

* The Associated Press
* Feb 15, 2013

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JUNEAU, Alaska - Joint Base Elmendorf-Richardson near Anchorage now receives 25 percent of its electricity from old trash.

Air Force Lt. Gen. Stephen Hoog, the senior military officer in Alaska, updated lawmakers on the status of the landfill gas power plant during a presentation to the Joint Armed Services Committee meeting Thursday.

Hoog expects the plant, which has been operational since September, to pay for itself in five years.

The project was made possible by a partnership with the Municipality of Anchorage and Doyon Utilities.

Hoog says the plant uses processed methane collected from the Anchorage landfill. That gas would have otherwise been vented and burned into the atmosphere.

Federal regulations require bases to power at least seven percent of their operations using renewable energy.

Document 15

Climate change

* By John D. Callahan / Fairbanks Fairbanks Daily News-Miner
* Sep 30, 2012

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Climate change

Sept. 26, 2012

To the editor:

The No. 1 issue you don’t hear about in the upcoming election is global climate change. Big oil and coal corporations have been highly effective in the denial effort, especially in Washington with huge donations to campaigns. The Koch brothers, BP, Exxon Mobil and other energy interests, working with such groups as the Competitive Enterprise Institute and National Chamber of Commerce, have convinced nearly half of America that climate change is not a problem.

This effort by big energy can be expected considering the trillions tied to drill rigs, pipelines, refineries and filling stations. The coal industry has huge investments in mountain-top removal mining and supply for power plants. The unfortunate thing is that a scientific fact became political issue when Al Gore got involved and made such statements that the sea levels would rise 30 feet. This gave the deniers a valid argument.

The sea level has risen about six inches in the past 100 years and will rise about an inch per decade. This can be dealt with as the Netherlands has done with some costs. The climate models developed by scientists previously are so accurate they predict the climate we are experiencing. Not only the rise in temperature, but drought, storms and floods such as in Pakistan and Thailand. Texas and Nebraska had a drought that lasted the entire summer.

Burning of fossil fuels causes acidification of the oceans from the high concentrations of carbon dioxide in the atmosphere that is absorbed into ocean water, forming carbonic acid. This is casing loss of coral reefs and affecting shelled sea life. Warming of ocean water also is affecting salmon migration and may affect Alaska’s fishing.

For those who are interested, there are two books I think are among the best: “The Weather of the Future,” by Dr. Heidi Cullin and a book pertaining specifically to Alaska, “Early Warming,” by Nancy Lord.

John D. Callahan

Fairbanks

Document 16

Climate change conundrum

* Charlotte Cannon Fairbanks
* May 29, 2017

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May 24, 2017

**To the editor:** We know that “science” has been removed from the mission statement of the Environmental Protection Agency. We know the climate change website prepared by the EPA has been removed. We know scientists at the EPA have been silenced.  We know a climate change denier is heading the EPA.

One bit of science that hasn’t changed is the formula for ice: Water plus cold equals ice.

NASA time-lapse photography has documented the loss of permanent ice in the Arctic Ocean over the course of some years. It’s gone. We used to have a long-term research station called T3 based on the permanent ice and used by the University of Alaska. This is no longer an option. There is no permanent ice left there.

Two big questions: Why is there a lack of permanent ice in the Arctic Ocean? What caused the disappearance of the ice? There is an abundance of water available in the Arctic Ocean, so the only part of the formula missing is cold. What has happened to the cold in the Arctic Ocean?  Who is going to solve this conundrum?

Document 17

Climate change not man-made

* Michael Melavic Fairbanks
* Apr 10, 2017

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March 29, 2017

**To the editor:** The sun controls climate on Earth, not mankind. Climate change is normal and on a 206-year cycle.

Starting now, the Earth will go on a cooling trend because of lower sun activity.

Believe what you want, but I like to look at all the information.

I have found a book called “Dark Winter” by John L. Casey. It makes more sense than climate change.

Document 18

Time to act on climate change

* Dana Greci, Fairbanks
* Jul 27, 2016

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**Fairbanks Daily News-Miner letter to the editor:**

July 27, 2016

**To the editor:** I recently read a book by Carla Wise — biologist, environmental writer, and mother — called “Awake on Earth: Facing Climate Change with Sanity and Grace.” Reading it broke through my despair and paralysis concerning the frightening specter of climate change. Her main point is that, even though time is strongly against us in terms of preventing significant damage to people’s lives, turning that tide around is not completely impossible. The recent slowing of tropical deforestation, the decline of coal use, the increasing accessibility of renewable energy, the rise of climate activism, and the passage of the Paris accord all suggest that change is still an option.

In Alaska, we are ahead of many other places: We have already developed much of the self-sufficiency and resilience that will help prepare us for the coming changes. In many ways we already have a safety net in place for a complicated future. Even if the future is difficult or tragic, it can be positive too. How we imagine it changes how we feel and act, and how positive it turns out to be.

We resist change, especially when we think failure is likely. But building our community’s strength and choosing how we each want to participate in the change counters that pessimism. There are many small ways to reduce our carbon consumption: hanging clothes to dry sometimes, saying no now and then to trips that use motorized vehicles, buying one less product we don’t really need, and adding solar panels to our homes are just a few. Sky’s the limit where our human inventiveness is concerned. Express yourself in your own unique way to help create the world you want to live in.

Reading Carla’s book is a great place to start. And in Fairbanks, two local groups are working on developing our ability to make changes: the Fairbanks Climate Action Coalition and the local chapter of the national group Citizens’ Climate Lobby. Whether you think climate change is human-caused or not, it is here, and it is time to take action in the ways we feel ready to do so.

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Climate change action overdue

* Tom Baring Fairbanks
* Mar 14, 2016

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March 7, 2016

**To the editor:** Except for mushers and ice carvers, I haven’t heard anyone complaining about the weather. It’s been a very easy winter but, not to detract from anyone’s enjoyment, I find it ominous.

2015 was the hottest year on record, breaking the previous 14 records, all of which were set during the last 17 years. According to the Feb. 21 News-Miner article, “New data finds unusually high temperatures in Arctic,” January was the hottest month ever recorded on Earth and the anomaly was especially great in the arctic.

Meanwhile, atmospheric CO2 is now more than 400 parts per million (compared to the pre-industrial level of 280 PPM) and it keeps on growing.

Along with easy winters, of course, we get ice storms and power outages, coastal erosion and stranded walrus herds as sea ice becomes less predictable, sinkholes and infrastructure damage as permafrost melts. The oceans are warming and becoming more acidic from excess CO2, which is bleaching reefs and altering marine ecosystems, including those on which Alaskan salmon rely.

Until we shift from fossil fuels to alternative energy sources, CO2 concentrations will continue rising and rising and the planet and our oceans will keep getting hotter and hotter. The trend isn’t going to stop now, just for us.

What’s discouraging is that scientists have been warning about global warming for more than 50 years and it’s been very much in the public eye for 25. The original U.N. Framework Convention on Climate Change was signed by 154 nations in 1992, back when George H.W. Bush was president. And what have we done?

What’s encouraging, on the other hand, is that last December, 195 countries, including the U.S. and China, accepted the Paris Agreement to reduce CO2 emissions. We need to do everything possible to help it succeed. We must tell our representatives that this is a top priority and reject any candidate that supports willful ignorance of climate change. And we must continue to decrease our own personal waste and consumption of fossil fuels. I hope we don’t have to wait for some truly cataclysmic event to finally take this seriously.

Document 20

Science clear on climate change

* John Callahan Fairbanks
* Aug 29, 2015

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**News-Miner letter to the editor:**

Aug. 26, 2015

**To the editor:** Recently, there were interviews in the News-Miner with people regarding President Obama’s upcoming visit to Alaska related to climate change. Scientists in the 1820s discovered the greenhouse effect was due to CO2 concentrations. In the late 1800s, Alexander Graham Bell wrote that unchecked burning of fossil fuels would have greenhouse effects and advocated the use of alternate energy sources such as solar energy. In the 1980s, scientists found the earth was rapidly warming because of the use of fossil fuels. Much of the increase in CO2 causing global warming is man made from burning of petroleum and coal.

The results are well known but still disputed. The petroleum industry has spent hundreds of millions of dollars on disinformation through such groups as the Competitive Enterprise Institute, lobbying and campaign funding of legislators. As the controversy increased, a petroleum executive hired a public relations firm to mount an anti-global warming propaganda effort for $250,000. That was small potatoes — since that time, they have spent very serious money. As exposed by the Freedom of Information Act, oil industry leaders have admitted global warming is occurring as a result of burning fossil fuels.

Nearly all major science groups agree we are experiencing increasing destructive global climate change. These include the National Academy of Science, the British Academy of Science and the Union of Concerned Scientists. An excellent book on the subject is “The Weather of the Future,” by Heidi Cullen and also Michael Mann’s book Hockey Stick and the Global Warming Wars. This problem affecting the globe but can be solved, the first step is to recognize it. In the same vein, the Dust Bowl also was a man-made problem that was essentially ignored until the farmland of America was a wasteland. Many of our national leaders are ignoring global warming, and it will be up to us to get them to act.

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Time for action on climate change

* Eric Schaetzle Fairbanks
* Jul 30, 2015

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July 28, 2015

**To the editor:** On Monday, July 27, Fairbanks made front-page news in the Washington Post. The headline of Chris Mooney’s article in the paper read “Alaska’s scorched summer.” Wildfires were also the topic of Ned Rozell’s column in the News-Miner the day before, “Alaska’s wildfires and the changing boreal forest.” And on Tuesday, July 28, we read Dorothy Chomicz’s interview with Glenn Juday, “Stress sets Fairbanks’ white spruce up for failure.”

The effects of climate change continue to make state and national news daily, which is why it’s good to read about the solutions as well. In Stefan Milkowski’s Thursday, July 16 op-ed, “A conservative approach on climate,” he describes a revenue neutral carbon fee and dividend. As he pointed out, the cost of climate change to Alaskan families is already high and it’s only continuing to rise. But the cost of a revenue-neutral carbon fee is returned to Alaskans in a dividend, and provides the incentive needed to change our energy consumption habits and look at clean, low-carbon energy alternatives — the very actions needed to reduce our contribution to climate change. Why, even ExxonMobil CEO Rex Tillerson said it’s “the most efficient means of reflecting the cost of carbon in all economic decisions.” That’s a surprising endorsement coming from an oil company, but not a bad thing for an oil-dependent economy like Alaska.

Faced with the rising costs of climate change, let’s take action to address it. We have the ability. Mooney, Rozzell, and Chomicz quoted UAF scientists in their articles; our flagship university leads Alaska in research and innovation. We have the resources. Take a look at the “Renewable Energy Atlas of Alaska.” We have political will. Governor Walker called Alaska “ground zero of climate change.” And this isn’t exactly an untested policy. In 2008, British Colombia adopted a revenue-neutral carbon fee. In the words of Glenn Juday, “Hey, we got to roll up our sleeves and think of these futures, and prepare and plan for them."

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Action needed on climate change

* Shannyn Bird Fairbanks
* Mar 8, 2015

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**Fairbanks Daily News-Miner Letter to the Editor**

March 3, 2015

**To the editor:**Visit [www.climatechange.alaska.gov](http://www.climatechange.alaska.gov/) and the most recent date on the homepage is 2008. You read that right: 2008. Climate change is no less of an issue than it was in 2008. Yet today, nearly seven years later, it still seems as if our state government hasn’t made much progress in addressing the problem. As it so happens, Gov. Sarah Palin established an Alaska Climate Change Subcabinet in 2007 to “develop and implement a comprehensive Alaska Climate Change Strategy.” This subcabinet was promptly nixed by Gov. Sean Parnell, placing Alaska back at square one.

With a newly elected governor, Alaskans now have no excuse to avoid the climate change issue any further. And what better way to get back in the game than to reinstitute the taskforce on climate change? Gov. Bill Walker’s transition team recently stated that “inclusion of Alaskans’ expertise ... is critical to ensuring that good decisions are made about our lands, waters, and communities.” This would be exactly the goal of such a taskforce: implement a diverse group of Alaskans to make educated recommendations about climate change. A taskforce wouldn’t singlehandedly defeat climate change, but it would be a step in the right direction, a step which needed to be taken years ago.

On that note, I speak directly to Gov. Walker: it is time to convene a task force that addresses the causes and consequences of climate change. If Alaska is ever going to effectively combat climate change, there is no better time to start than today.

**Shannyn Bird**

*Fairbanks*

Document 23

Ignoring climate change

* Michelle Cason Fairbanks
* Jan 31, 2014

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**Letter to the editor**

Jan. 30, 2014

**To the editor:** It has been weeks since the unusual cold in the Midwest and icy warm here in Alaska, both of which caused school and work closures, vehicular dangers and newscasters’ ridiculous demonstrations of the sensation of cold. And it has been days since snow in the southern U.S. caused overnight gridlock and another national disaster. Yet, the only discussion I hear is who to blame for the mass panic that ensued. Why is no one addressing the elephant in the room?

Why is there not widespread public discussion of natural disasters when we plan our infrastructure, school calendar, local, state and federal budgets?

How many times must we be caught off guard before we realize abnormal is the new normal? How many unseasonal freak storms have to happen before the emission of greenhouse gases becomes more than a save-the-environment issue? When will we set aside funding and make concrete plans and backup plans for the fallout of global-scale dramatic shifts in weather predictability?

Where is the climate change discussion?

Document 24

Climate change and the people of the Mesa

* Ned Rozell / Alaska Science Forum
* Dec 30, 2012

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FAIRBANKS - Alaska was once the setting for an environmental shift so dramatic it forced people to evacuate the entire North Slope, according to Michael Kunz, an archaeologist with the Bureau of Land Management.

About 10,000 years ago, a group of hunting people lived on the North Slope, the swath of mostly treeless tundra that extends north from the Brooks Range to the sea. These people, known as Paleoindians, used a chunky ridge of rock west of the Colville River as a hunting lookout. Michael Kunz first discovered stone spear tips at the site, known as the Mesa, in 1978.

The people of the Mesa lived at a time when the Arctic was undergoing a change similar to what Alaska is undergoing today. As the world emerged from the last ice age, grasslands covered much of the Bering Land Bridge, a swath of land as wide as the distance from Barrow to Homer.

To survive in a place like the North Slope, where life is dicey in the best of times, humans needed a few things, Kunz said. One was technology, which the Mesa people had in the form of bone needles they used to sew weather-tight clothing. Another vital element was a large, plentiful source of food. Caribou were scarce during the time of the Mesa people, but bison roamed the grasslands in good numbers. Those bison are the key to how climate change affected these ancient Alaskans, Kunz said.

For many thousands of years, the area that is now Alaska was part of an enormous swath of dry grasslands that made up much of the Bering Land Bridge. About 15,000 years ago, the planet started evolving from the last ice age. Air temperatures became warmer, and things started to change. Glaciers began melting, sea level rose, and salt water slowly drowned the Bering Land Bridge. The encroachment of the ocean caused an increase in precipitation around the North Slope that allowed cottongrass and other sedges to nudge out the grasses preferred by bison.

About 12,000 years ago, as the North Slope evolved to what it looks like today, bison disappeared. The last evidence of the Mesa Paleoindians comes from around the same time. Kunz thinks the extinction of the bison from the North Slope, along with the simultaneous scarcity of caribou, caused the Mesa people to move or die out.

“This is totally the effect of the environment,” Kunz said. “Not only did it run the Paleoindians out of there, it made the place unlivable for anyone for 1,500 years.”

By examining bones and stone tools, archaeologists found that people moved back to the North Slope about the same time caribou returned after what seems like a population crash that lasted more than 3,000 years.

Kunz pointed out that car exhaust did not trigger the warming that may have chased the Mesa people from the North Slope. He said climate change has occurred many times before and is inevitable today. He suggests that the human species as a whole should think of how it will work around problems, such as rising sea level and the changes in agricultural zones caused by different weather patterns.

“The system has always been dynamic,” he said. “We’re not going to stop climate change. Just like the Mesa Paleoindians — if you can’t adapt or adjust, you’re going to disappear.”

*Since the late 1970s, the University of Alaska Fairbanks' Geophysical Institute has provided this column free in cooperation with the UAF research community. Ned Rozell is a science writer for the Geophysical Institute. This column first appeared in 2001.*

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Stop passing the buck on climate change

* By Philip Martin
* Mar 19, 2017

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**News-Miner Community Perspective:**

When I began gardening in Fairbanks in the 1980s, killing frosts commonly occurred in August. But in recent years, I have been able to harvest well into mid-September. Climatologists tell us that Alaska is warming at twice the global average rate, and gardeners are not the only ones who have noticed. Native elders observe that natural seasonal patterns that have guided subsistence practices for centuries are no longer reliable. Glaciers popular with sightseers (Columbia, Mendenhall and Portage, for example) have receded far from their former scenic viewpoints. Seeing is believing, and perhaps that is why most Alaska residents accept climate warming as fact.

Alaska is especially vulnerable to climate warming, not only because warming is more rapid here, but because much of our infrastructure is built on on ice-rich soils. As the air warms, the permafrost is thawing and creating something akin to a “spring breakup” that lasts decades instead of mere days as solid (frozen) ground gives way to mud and water. A recent study, “Climate change damages to Alaska public infrastructure and the economics of proactive adaptation,” published in the Proceedings of the National Academy of Science, projected climate change damages to Alaska’s publicly owned buildings, roads, airports and pipelines because of flooding, permafrost thaw, precipitation and freeze-thaw cycles. The predicted price tag from 2015-2099 is in the range of $4.2 billion to $5.5 billion.

But wait, there’s more! That study left out damage caused by coastal erosion, deep permafrost thaw, damage to village water and sewer systems and disruption of fisheries because of changes in the riverine and marine environment, for starters. Furthermore, damage to privately owned infrastructure — your home or business or the Alyeska Pipeline — wasn’t included. It is easy to extrapolate that the total price tag for Alaska could run into the tens of billions of dollars or higher. What an unfortunate legacy to leave to the next generations!

Elsewhere in the U.S., local governments are taking threats such as climate-associated sea level rise seriously. Miami Beach is investing hundreds of millions of dollars in pumps and construction projects to raise roadbeds. The city of Boston is contemplating a sea barrier across the harbor estimated to cost tens of billions of dollars. As Alaska’s climate bill comes due, it is unlikely that we will compete successfully for scarce federal dollars compared to these more populous and well-prepared communities. With the state budget in decline, it is probable that local governments will be left grappling with problems whose origins are well beyond their control.

What can be done? Limiting our future climate change liabilities means limiting carbon emissions, and that is a global problem that can only be addressed at the national and international level. Unfortunately for us, the Trump administration appears poised to reverse U.S. climate policy and to abandon all initiatives intended to reduce carbon emissions. Our congressional delegation has enthusiastically greeted the ascension of climate skeptics such as Scott Pruitt (EPA administrator) into high-level positions in the new administration. Sen. Dan Sullivan has decried the “over-reaching jurisdictional expansion of the EPA’s regulatory authority” in attempting to reduce carbon emissions through its Clean Power Plan.

Whether there has indeed been overreach is a matter currently working its way through the courts. What is perfectly clear, however, is a history of congressional inaction on the issue of climate change, and our delegation has been complicit. With so much at stake for Alaska, Sens. Lisa Murkowski and Dan Sullivan and Rep. Don Young should instead be outspoken leaders in a political alliance for sensible climate policies. These include:

• a robust multi-agency climate science program to better define risks and probable trajectories of environmental change, including a focus on arctic systems;

• vigorous support for adherence to the 2016 Paris Climate Treaty, our best opportunity to influence actions by other nations which affect us significantly; and

• strong incentives for development and adoption of energy conservation and renewable energy technologies that will reduce global carbon emissions, create new jobs and lower the staggering energy costs that currently afflict our communities and families.

We are at a critical political juncture, with Washington. D.C., politicians charting a course that threatens our economy and natural resources. Doing nothing is not without cost. It is time for Alaska’s political leaders to stop passing the buck to our children and grandchildren.

*Phillip Martin is a biologist and longtime Interior resident.*

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Villages most affected by climate change

* By Barrett Ristroph
* Jun 19, 2016

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**News-Miner Community Perspective:**

Alaska Native villages face some of the highest climate change risks in the nation due to their eroding and flooding shorelines, limited resources, impacts of colonization and strong connection to traditional lands, waters and wildlife they do not wish to leave behind. Some Alaska coastal villages are expected to be underwater as early as the 2020s. Every article that appears on this subject evokes fierce debate about whether saving these communities merit spending hundreds of millions of dollars for relocation.

Let me first disclose my bias on this issue before moving to a much bigger issue. I believe that climate justice offers a reason for Alaskans and Americans to empower Alaska Native village adaptation. Many Alaska Native villages did not choose to give up their adaptive lifestyles in favor of permanent settlements on lands that were never suitable for this purpose. Settlement was required by U.S. law and policies. Further, the American people as a whole (and particularly Alaskans) have benefited from our historic and current contributions to climate change.

Despite the many legal and practical challenges to relocation that Native villages face, the task is not impossible and need not take away funding from other Alaska communities. The Native village of Eagle was able to completely relocate after an ice jam in 2009, using hazard mitigation funds provided by the Federal Emergency Management Act (FEMA). Grants offered through FEMA’s Pre-Disaster Hazard Mitigation program, the Indian Community Development Block Grant program, and the Natural Resources Conservation Service’s Emergency Watershed Protection Program may provide a starting point for other Native villages prior to a flooding disaster.

But before we arm ourselves to fight in favor or against government-assisted relocation, let’s step back and consider the larger question of the best ways to provide for adaptation. Not every Native village needs or wants to relocate. Villages like Shaktoolik have been working on practical measures to stay in place as long as possible, including the construction of a coastal berm out of local materials and plans for a local evacuation mound that can provide refuge during a severe flood. Villages like Nulato and Allakaket have been moving on a gradual basis, providing for new housing to be constructed on adjacent high ground not vulnerable to flooding.

While our laws pertaining to climate change and related disasters are certainly ripe for amendments, there is much that can be done within the existing framework. One of the first steps is to better understand how Native villages are actually managing adaptation challenges on their own, instead of just focusing on how difficult climate change impacts can be. The next step is to establish forums where these communities can share strategies with each other and improve communication with outside agencies and entities that can offer assistance with implementing these strategies. Returning to my earlier point about climate justice, it is essential that the voice and knowledge of Alaska Native villages not be lost in the process.

*Barrett Ristroph is a lawyer and Ph.D. candidate examining how Alaska Native villages are adapting to climate change and how the law helps or hinders.*

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Finding a climate change solution

* Doron Partyka Ester
* Mar 21, 2016

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March 13, 2016

**To the editor:** Imagine that the experts agree — there is a solution to climate change. What do you think the solution will look like? Will it include idling cars? Plastic bags full of groceries? Microwaveable dinners served in styrofoam. Have you lost hope?

My great uncle pointed out that there is great untapped political power for change in every citizen. What would happen if we all stopped idling our cars, if the norm was that we had our own reusable grocery bags and baskets, that we cooked meals together with local and organic produce? Might our representatives start to pay attention that we really do want a clean earth?

Without making these changes myself, I feel I have no standing to ask our representatives to strive towards a much-needed progressive environmental policy. Please join me. I would like to thank those people who have not given up hope — people who carry baskets to the store, who don’t mind wearing a jacket instead of idling their car and those who continue to strive to live more sustainably. I ask for forgiveness for my carbon footprint and rededicate my efforts towards a more righteous path.

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Climate change action starts local

* John Duffy
* Aug 23, 2015

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**News-Miner Community Perspective:**

“Think global, act local” is a cliché, but it’s also a reality for borough, city and village leaders across Alaska who must confront the direct impacts of global climate change. Left with few choices, local leaders and their constituents are developing new and innovative ways to protect and preserve their communities.

Climate change has become a hot-button political issue at the national and state levels, and attempts to address it have been delayed — even pushed aside — by partisanship. Political blockades have thwarted most attempts to set national policy.

Local leaders can’t wait for the federal government and many state governments to adopt tighter emissions standards, emergency management practices or other mitigations. Alaskans have confronted firsthand the damaging ice jams, thawing permafrost, destructive coastal erosion, devastating wildfires and other real problems. The effects of climate change are well-known and observed daily.

Local governments cannot afford to debate whether climate change is lasting or just temporary, whether it is naturally occurring or produced by human activity, whether it will last 50 years or more than 100. Regardless who or what is to blame, local governments have to take action. Roads and utility lines, homes and offices, schools and hospitals must be maintained and protected.

While citizens are cynical about “big government,” they still expect their local governments to work efficiently and deliver direct services.

For local leaders, climate change is not a political football or snippy sound bite. Their communities cannot afford such behavior. Climate change and its impacts present life and property decisions that can harm, even ruin communities and their services. No mayor can stand on the sidelines watching city streets wash out to sea. While politicians in Washington, D.C., talk, Alaska communities must react.

Alaska’s boroughs, cities and villages are responsible for protecting lives and property every day. Beyond the routine fire and police calls, this includes wildfires, floods, coastal erosion and extreme storms. Not only do local governments respond to disasters and damage, they plan ahead to take action to reduce the severity of these events and build more resilient communities.

Alaska’s local governments know that doing something today to adapt, address and lessen the damages of climate change makes tomorrow’s risks easier to manage, while saving current and future taxpayer dollars in the process.

When Sitka finished the expansion of its Blue Lake Hydroelectric Dam, it obtained a source of affordable, fish-friendly, clean energy for generations to come. With no federal funding and only one-third state funding, the community made it happen by accepting higher utility bills now for greater benefits in the future.

When Galena was hit with record-breaking floods, the city manager and mayor worked with construction companies, neighbors and charities to bring back electricity, potable water, facilities for elders, and even softball fields and the indoor pool. Shelters and living accommodations were rebuilt and community morale was restored when local officials found solutions.

When the Fairbanks North Star Borough (FNSB) renovated its school facilities, it reduced the energy use rate per square foot to one of the lowest in the state. The Alaska Housing Finance Corporation acknowledged the major gains from the reduced energy footprint. FNSB also installed energy efficient lighting in most borough facilities to save electrical energy costs and converted many of its large public buildings from fuel oil to clean-burning natural gas.

With natural gas, communities in Interior Alaska are committed to improving the air quality, and reducing airborne particulates and sulfur emissions, which benefits the health of all residents.

Investments in disaster resilience, such as earthquake-resistant designs for public buildings, recognize that every $1 spent on mitigation returns at least a 10-fold benefit in reduced post-

disaster rebuilding and repair costs.

Instead of endlessly debating an issue that is already occurring before our eyes, Alaska’s local governments are taking action to protect the public — and taxpayer investments — by building disaster-resilient communities.

State and federal lawmakers and agency officials can learn from Alaska’s local leaders. The lessons are straightforward: Stop fighting science, stop the distraction of dueling experts, stop the made-for-TV accusations and stop the partisanship. The time has arrived for definitive action to preserve and protect our communities.

*John Duffy is the former manager of the Matanuska-Susitna Borough. He submitted this piece on his own behalf and that of the following: Mike Navarre, Mayor, Kenai Peninsula Borough; Mike Taylor, Mayor, City of Gustavus; Walt Wrede, Former City Manager, Homer; Maija Katak Lukin, Mayor, City of Kotzebue;Lamar Cotten, Local Government Consultant, Former Rural Municipal Manager; Denise Michels, Mayor, City of Nome; Randy Robertson, City Manager, Cordova; Alice Ruby, Mayor, City of Dillingham.*

Document 29

Are cow burps the key to climate change?

* By Chris Mooney The Washington Post
* Aug 3, 2015

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First, let’s get one thing straight. Despite what you may have heard, it is cow burps, not cow farts, that are the real climate change problem.

Here’s how it works: Cows digest their food in four-part stomachs, including a “rumen,” which is a site that allows for fermentation — a process that gives off a lot of carbon dioxide and methane gas, as microorganisms aid in the process of digestion. That gas has to get out of the cow’s body somehow — hence, burps. “Approximately 132 to 264 gallons of ruminal gas produced by fermentation are belched each day,” notes the Penn State College of Agricultural Sciences.

And because we have so many cows — where would human civilization be without them? — this really adds up. Indeed, according to the EPA, so-called “enteric fermentation” in cows and other ruminant animals, like sheep and goats, contributed 26 percent of the country’s total emissions of methane, a hard-hitting greenhouse gas with much greater short-term warming consequences than carbon dioxide does (though the latter packs a far greater long-term punch).

Globally, meanwhile, methane emissions from livestock are an even bigger problem. Overall, the livestock supply chain emits 44 percent of the globe’s human-caused methane, according to the U.N.’s Food and Agriculture Organization — and a large slice of that comes from cattle’s methane burps. So anything you could do to cut down on cow belching would, literally, help save the planet.

The ideas for how to do this have been numerous — and sometimes hilarious. We’ve heard about cow backpacks, for instance, to capture methane and put it to use. And there are also more mundane solutions like simple “husbandry,” says Johan Kuylenstierna, policy director of the Stockholm Environment Institute.

“You could reduce emission intensities — i.e. emissions per kg meat or milk, by about 30 percent if people in a given region adopted the good practices of the top 10 percent of farmers that have the lowest methane emissions,” Kuylenstierna says by email, citing the FAO. This includes keeping animals healthier, giving them better diets, and managing their reproduction to lower their overall emissions.

But one fundamental way of fixing the problem involves trying to change the chemistry of what’s happening in cows’ rumens — after all, methane emissions represent lost food energy that could have gone towards cow growth or milk production. For some time, Dutch life sciences and materials company DSM has been pursuing such a solution, which it appropriately calls its “Clean Cow” project.

DSM is a Netherlands-based life and materials sciences giant with 10 billion euros (about $11 billion) in annual sales — including 32 percent of its market in animal feed. The company has created a powder that can be added to cow feed that, it says, can produce “a reduction of over 30 percent in methane emissions with no negative impact on animal welfare, performance, or the amount of feed they consume.” And now, newly published science backs this idea up.

DSM worked with a top dairy sciences researcher who focuses on methane emissions, Alexander Hristov of Penn State University, to study the clean cow technology — what they more technically called a “methane inhibitor.” And they got promising results.

Hristov and colleagues, including several researchers from DSM, designed and carried out a trial in which 48 cows, receiving varying amounts of the inhibitor in their feed, were observed over 12 weeks. Their methane emissions were measured when they put their heads into feeding chambers which also had atmospheric measurement sensors, and also through nostril tubes attached to canisters on the backs of the cows.

The result was that the inhibitor “decreased methane emissions from high-producing dairy cows by 30 percent,” the research found.

The substance “blocks one of the steps of the enzymatic process that produces methane from carbon dioxide and hydrogen,” explains Hristov. And he notes that in that process, energy is actually being lost in the form of methane. So with less methane generated, Hristov says, the cow has more energy that can instead be converted to growth and milk production.

“In our case, that energy didn’t go to milk production, but the cows actually gained more body weight, basically the energy was directed towards body weight gain,” says Hristov. The published study discloses that the research was partially supported by DSM.

The real trick may be getting farmers to adopt the technology — but according to Hugh Welsh, president of DSM North America, they may ultimately have an economic incentive for doing so.

“We’re looking to a day when there really will be a price on carbon, or where a farmer will be able to sell carbon credits for using this in his feed,” says Welsh. He says the company hopes to be able to take the inhibitor commercial by 2018.

So in sum, cows remain a major contributor to climate change, and just as with caps on tailpipe and smokestack emissions, we will need to find a way to curb that contribution. There are many contending solutions — but perhaps the fix will turn on changing what’s happening in a cow’s stomach.

Document 30

Climate change signs all around

* Jimmy Wise III Crow Village Sam School, Chuathbaluk
* Mar 8, 2015

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**Fairbanks Daily News-Miner Letter to the Editor**

March 3, 2015

**To the editor:** There has been a big amount of berries where I come from for many generations. These past few years, the berries, geese, moose and ducks have been missing because of climate change. Our traditional values are bursting. Our solution is simple. The governor has only one thing to do — decide what we live by. Make sense, make it work, make it right. Climate change won’t stop without us.

**Jimmy Wise III**

*Crow Village Sam School, Chuathbaluk*

Document 31

Sen. Murkowski wrong on climate change

* Desmond Cole Fairbanks
* Nov 12, 2014

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**To the editor:** Sen. Lisa Murkowski soon will chair the Senate Committee on Energy and Natural Resources. I was dismayed to hear her recent analysis that, although climate change is a serious issue, it may have less to do with human carbon emissions and more to do with natural causes, in particular volcanoes.

Sen. Murkowski’s apparent implication that climate change is not man-made is wrong. There is nearly a scientific consensus that recent global warming is a man-made phenomenon. It is also a misguided attempt to shift the discussion away from reversing climate change toward accepting it as inevitable and learning to cope.

I am not angry with Sen. Murkowski. She is a good person and a pragmatic politician. I also have no truck with those who stupidly argue that she and the Republican-led Senate will eschew sensible policies for the sake of power and profit.

Instead of angry, I am scared. I am scared of more droughts in dry places of the world, and more cataclysmic floods in wetter regions. I am scared of waking up one morning 30 years from now and learning that climate change and all its ills are truly irreversible. I am scared of raising my children in a world that is worse off than the one we have now.

Most of all, I am scared by Sen. Murkowski’s implication that mankind cannot stop global warming. I have such hope in our potential. Renewable energy is getting cheaper and better. The United Nations is taking another stab at an agreement to cut emissions. Scientists, engineers and businesses across the globe are developing technologies to make our energy cleaner. But all this potential is worthless if we accept massive climate change as inevitable and learn instead how to cope.

Sen. Murkowski has a crucial role to play in all this. If she can be brave enough to argue climate change is manmade, and mankind can undo the damage, then we will all be better off. Future generations will thank her for displaying the courage it takes to save the world.

Document 32

The creeping effect of climate change on Bush life

* Julie Collins, for the News-Miner
* Oct 21, 2017

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Lake Minchumina — Numerous natural events hinge on a single degree, the difference between freezing and thawing. As the autumn sun dips ever closer to the horizon and the nights grow longer, we shift our attention from fall to winter, from gardening and moose hunting to fishing and trapping. At least, that’s the plan. Since roughly the turn of the millennium, the seasonal progression has usually stalled out during the fall — the “extended shoulder season” predicted by climate scientists.

We once preferred waiting to pick cranberries until the first frost sweetened the berries. We pulled potatoes after that first frost wilted the vines. We hunted moose after nightly frosts intensified the rut, making bulls easy to find, and often left some meat hanging outside until it froze with the approaching winter. We pulled carrots in mid-September before the ground froze for the winter, and switched the sled dogs from water cans to morning soup when the cans froze.

We usually pulled our fish net right before the lake froze, and made a final trip across the lake to the post office before cranking the boat out one last time, hauling it high above the reach of drifting spring ice. Before the turn of the millennium, we often boated to mail one freezing early-October day, and ran the dogs along the frozen lake edge to the post office just a few days later.

Of course, every year presents different weather, but a pattern has emerged in recent decades in which the first September frost occurs at the end of the month instead of the beginning or is even delayed until mid-October.

When the temperature crosses a critical boundary from daily thawing to remaining frozen, winter arrives in earnest. That used to happen during the first half of October. Occasionally, it still does happen at the normal time. But more often, our fall weather continues almost until Halloween.

This unpleasant in-between weather extends freeze-up for weeks, and some ground-water creeks do not freeze until late December.

Ten or 15 years ago, we were forced to delay trapping into mid- or late November because the rivers hadn’t frozen yet, and while that problem continues, in recent years we’ve been forced to delay trapping even into December because the lack of snow makes travel too difficult and dangerous.

When the temperature drops below that critical point of freezing, the silty river delta that flanks our yard freezes. At that point the water that normally clings to fine silt and sticks it firmly to the ground will pull away to form ice, leaving the suddenly-dry powder free to lift and flow in the wind. The resulting dust storms during big blows might continue into late November on snow-free years, saturating everything from firewood to snow machines and outdoor gear.

Worse yet are the unprecedented November rain storms that have slammed us several times since 2010. That single degree between freezing and melting allows water instead of snow to cover the frozen ground. Ice glazes any valuables left uncovered, from airplanes and snow machines to fire wood and dog houses. The accumulated water floods onto lakes and rivers to create massive overflows. Unlike the light, soft insulating cover of snow, the ice allows cold to penetrate the leaf litter, making life hard on animals like voles and grouse who normally burrow under the snow to stay warm.

Another big effect created by that one degree between freezing and thawing over a long time period is the melting of permafrost. In our area, most of the vast permafrost fields are less than a single degree below freezing, and with continued warm weather we’ve seen more and more slumps, erosions, and upheavals from collapsing permafrost, which make wilderness travel rough and often dangerous.

These days we feel it’s pretty pointless to wait for a frost to pick cranberries; the grouse and bears consume most of them before the delayed frost, and the rest are covered with fallen leaves by the time the berries turn sweet. We occasionally leave root vegetables in the ground into October as the weeks trickle by without a hard freeze.

After taking roughly 28 moose in 30 years, for four of the last eight years we’ve been unable to find a moose for winter meat. (This is due only partly to the delayed rut; it’s also from arthritis problems and outside hunting pressure.) These days we don’t dare leave much meat hanging because it could be six weeks until it freezes outside.

Managing the fish net poses quite a problem when the normal fall temperature decline stalls right at freezing, not for days but for weeks. We don’t want it to freeze into the ice, but if we pull the net out to wait for safe ice, we won’t have fish to feed the huskies. We used to pull the net when breaking waves began freezing on the lakeshore, but while that once meant an imminent freeze, when the thermometer just won’t settle enough for the main lake to freeze we could go for three weeks without a fish net, and that’s an awful long time to spend over $30 per day on commercial dog food.

All too often we crank the boat out for the winter, only to lever it back into the water days later because the lake still hasn’t frozen.

Delays, silt storms, winter rains, spoiling meat, disintegrating permafrost — what a difference a degree makes.

*Trappers and lifelong Bush residents Miki and Julie Collins have written three books, which are available at Gulliver’s Books in Fairbanks. They live in Lake Minchumina.*

Document 33

Alaska climate change documentary to be screened in state

* Debbie Carter / UAF Co-opertaive Extension Service
* Sep 28, 2017

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FAIRBANKS — Free screenings of a new documentary that highlights climate change in Alaska will be offered this week in Fairbanks, Palmer, Anchorage and Kotzebue.

“Between Earth and Sky: Climate Change on the Last Frontier” was shown in Kotzebue Wednesday and is showing at at the University of Alaska Fairbanks tonight, in Anchorageon Friday and in Palmer on Saturday.

Texas Tech Public Media produced the documentary, which was released in March and has been shown at environmental film festivals, more than a dozen universities in the Lower 48 and in Europe and on public broadcasting stations.

The documentary mixes interviews with Alaska scientists and climate change experts with the stories of Alaska residents affected by climate change. Scenic footage from across the state provides a backdrop as people talk about the shifting route for the Iditarod Trail Sled Dog Race, receding glaciers, coastal storms, erosion, wildfires and melting permafrost.

Executive producer David Weindorf said the movie was inspired by now-retired University of Alaska Fairbanks soils scientist Chien-Lu Ping and his 33 years of soils research. Ping started an annual Arctic soils field tour in 1989 and his last field trip, in 2015, was documented by the film crew.

Weindorf, a soil scientist and associate dean of research at Texas Tech University, participated in the tour with his students for more than 10 years and will help teach the class next year. He said the field trip attracted students and scientists from Italy, Japan and across the U.S. who wanted to learn from the soil scientist.

“What an international impact Chien-Lu has had,” Weindorf said. “He brought all of those people together.”

Weindorf said Ping identified many unique features of Arctic soils, including the high percentage of carbon. Weindorf said that’s important because 40 percent of the world’s carbon is tied up in subarctic and Arctic soils, and as temperatures warm, soils release carbon into the atmosphere, which contributes to the warming.

Weindorf has produced a second documentary that focused exclusively on Ping and on the field tour. “Between Earth and Sky: An Arctic Soils Perspective” is a more technical film and geared more to student in soils and environmental sciences.

The climate-change movie will be shown at 7 p.m. Sept. 27 at the Northwest Arctic Heritage Center in Kotzebue; at 5:30 p.m. Sept. 28 at the University of Alaska Fairbanks Murie auditorium; at 2:30 p.m. Sept. 29 at the Bear Tooth Theatre in Anchorage; and at 7:30 p.m. Sept. 30 at the Glen Massey Theater in Palmer. Weindorf will be at all the screenings and he will answer questions following the shows, joined in some locations by other scientists.

The documentary was directed by Paul Allen Hunton, the general manager of a Texas public television station, who has won three Emmys for his work as a documentary filmmaker.

The documentary is funded by the USDA National Resources Conservation Service, the University of Alaska Fairbanks, Texas Tech Public Media, Soil Science Society of America and the BL Allen Endowment in Pedology. The Fairbanks showing is sponsored by the Resource Management Society, a UAF student group. More information is available on the film’s website, betweenearthwandskymovie.com.

Document 34

Climate change a character in Discovery's 'Deadliest Catch'

* David Bauder, Associated Press
* Apr 11, 2017

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NEW YORK (AP) — Climate change is one of the main characters in the new season of "Deadliest Catch," with the crab fishermen in one of Discovery's most enduring and popular shows forced to deal with a sudden warming of the Bering Sea that chases their prey into deeper, more dangerous water.

That leads the adventure series into its own uncharted waters. The show's 13th season debuts Tuesday at 9 p.m.

"It's a big risk for us to discuss climate change because so many people can think that it's a political issue when really it isn't, particularly in the context of the fishing fleet," said R. Decker Watson, Jr., one of the show's executive producers.

The waters off Alaska that provide the livelihood for the show's real-life stars warmed by a dramatic 4 degrees in one year. The cold water-loving crab is depleted in the traditional fishing areas, so some of the boats strike out for new territory that is more dangerous because of fiercer storms and is further from rescue workers if something goes wrong, he said.

In fact, the new season documents one vessel lost at sea. It was not one of the crews regularly featured in the series, but all of the regulars knew who was involved, he said.

The developments offer an opportunity to educate an audience that might be less familiar about climate change. The median age of a "Deadliest Catch" viewer is 50 and the show skews 60 percent male which, judging by the results of the last election, might include its share of climate change skeptics. Yet Discovery isn't interested in preaching; the series is more interested in documenting what is happening, not in explaining why.

There are no scientists aboard the fishing boats, and the show's main purpose is to follow the lives of the crew, said Rich Ross, Discovery president.

"At the end of the day, the job of 'Deadliest Catch' isn't to teach people, it's to keep people at the edge of their seats," Watson said.

The season-opener of "Deadliest Catch" comes two days before Discovery airs the documentary, "Sacred Cod," about the collapse of the cod fishing industry in New England.

Earlier this decade, with the documentary series "Frozen Earth," some environmentalists criticized Discovery for side-stepping issues surrounding global warming. But at the end of 2015, the network aired the pointed documentary "Racing Extinction" about the depleting of species simultaneously in 220 markets around the world.

At a presentation for advertisers recently, Discovery Communications announced a multi-million dollar effort to fund a project that helps to restore the population of wild tigers in India. The project wasn't picked to avoid the larger, more contentious topic of climate change, but rather to go after a narrower, specific issue with an immediate chance of making a difference, said David Leavy, Discovery's chief corporate operations officer.

The show's new season isn't all about missing fish, as it documents the personalities of the men involved in the dangerous pursuit. One captain, Sig Hansen, narrowly survived a heart attack and this season is contemplating how long he wants to keep fishing.

Watson has worked his way up from being one of the filmmakers on a fishing boat to one of the show's leaders, and he feels a personal stake in what's happening in the Bering Sea and on the planet in general.

"When something like this comes up, it's felt by all of us," he said. "I love making this show, and so does the rest of my team. We look forward to going back to Dutch Harbor every year. There's something special about it."

Document 35

Interior nominee Zinke disputes Trump on climate change

* Matthew Daly, Associated Press
* Jan 17, 2017

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WASHINGTON (AP) — Donald Trump's choice to head the Interior Department on Tuesday rejected the president-elect's claim that climate change is a hoax, saying it is indisputable that environmental changes are affecting the world's temperature and human activity is a major reason.

"I don't believe it's a hoax," Rep. Ryan Zinke told the Senate Energy and Natural Resources Committee at his confirmation hearing.

"The climate is changing. The debate is what is that influence and what can we do," said the Montana Republican.

Trump has suggested in recent weeks he's keeping an open mind on the issue and may reconsider a campaign pledge to back away from a 2015 Paris agreement that calls for global reductions in greenhouse gas emissions.

In contradicting Trump, Zinke cited Glacier National Park in his home state as a prime example of the effects of climate change, noting that glaciers there have receded in his lifetime and even from one visit to the next.

Still, he told Sen. Bernie Sanders, I-Vt., that there is debate about how much humans have influenced the climate.

Likely to win Senate confirmation, Zinke sketched out a variety of purposes for the nation's vast federal lands, from hiking, hunting, fishing and camping to harvesting timber and mining for coal and other energy sources.

An admirer of President Theodore Roosevelt, Zinke said management of federal lands should be done under a "multiple-use" model set forth by Gifford Pinchot, a longtime Roosevelt associate and the first chief of the U.S. Forest Service.

Zinke also pledged to tackle an estimated $12 billion backlog in maintenance and repair at national parks, saying parks and other public lands should be a key part of Trump's infrastructure improvement plan.

Zinke has said he would never sell, give away or transfer public lands — a crucial stance in his home state of Montana and the rest of the West where access to hunting and fishing is considered sacrosanct.

Zinke feels so strongly that he resigned as a delegate to the Republican National Convention last summer because of the GOP's position in favor of land transfers to state or private groups. But Zinke's commitment to public lands has come into question in recent weeks.

The Interior Department and other U.S. agencies control almost a third of land in the West and even more of the underground "mineral estate" that holds vast amounts of coal, oil and natural gas.

Zinke's position on public lands came under fire after he voted in favor of a measure from House Republicans that would allow federal land transfers to be considered cost-free and budget-neutral, making it easier for drilling and development.

Zinke "says he's against transfer of federal lands, but there's a big gap between what he says and what he does in that regard," said Michael Brune, executive director of the Sierra Club, the nation's oldest and largest environmental group.

Zinke told senators Tuesday that he flatly opposes all sales or transfer of federal lands.

Indeed, his support for public lands was a crucial reason why Zinke was chosen by Trump. The president-elect and son Donald Trump Jr. both oppose sale of federal lands. The younger Trump, an avid hunter, has taken a keen interest in Interior Department issues and played a key role in Zinke's selection.

Zinke also reiterated his support for coal production on federal lands as part of an all-of-the above energy strategy

Sen. Maria Cantwell of Washington state, the top Democrat on the energy panel, asked Zinke about modernizing the federal coal program, saying it was important "to make sure American taxpayers aren't short-changed for the benefit of corporate interests

Zinke promised to review the coal program and said he thinks taxpayers "should always get fair value," whether it's coal, wind power or other energy sources.

Document 36

Climate change a big election issue

* By Diane J. Preston/Fairbanks
* Nov 6, 2016

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**News-Miner letter to the editor:**

Nov. 1, 2016

**To the editor:** There is a current issue that is urgent and critical. Candidates for national and state offices have been asked few questions about it even though it is the most important issue of this election. Questions about emails, sexual predation and the Supreme Court all pale in comparison to this issue, which the public ignores at our peril.

Are you a person of faith? If so, it’s probable that your faith tradition has a statement about this moral issue which calls for your action. Are you a parent or grandparent? If so, future generations are depending on you to help. Are you a Republican, a Democrat or an independent? It doesn’t matter — you and yours will be affected regardless of your political affiliation. The science is settled, the effects are evident, particularly in Alaska, and the time is running out for people and nations to act.

Climate change is the issue. In Alaska, villages are washing into the sea, melting permafrost threatens infrastructure and acidification of the ocean threatens fisheries. Elsewhere in the U.S., storms are devastating, droughts are contributing to record wildfires, and rising sea levels threaten our coasts. In parts of the world, high temperatures and rising seas are already creating suffering and environmental refugees. A current movie, “Before the Flood,” outlines what we are up against.

There is hope. Recently, 195 nations agreed to lower carbon emissions to mitigate adverse effects on climate. People of faith are awakening to the moral imperative to take action. Locally, solar panels are showing up all over. More people are eating less meat. Many are taking other steps to lower carbon footprints and move toward renewable energy and sustainability.

Political will is essential if we are to maintain the livability of our planet. Please vote for those politicians who acknowledge science, recognize the seriousness of climate change, and will work to mitigate the effects while providing for a just economic transition. At the national level, that means voting for Hillary Clinton. Locally, Steve Lindbeck and Luke Hopkins will work for a sustainable economy and reduction of climate problems.

Document 37

Panel to discuss climate change’s effects on the state economy

* Oct 19, 2016

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Community editor and columnist Kris Capps is a longtime resident of Fairbanks and Denali Park. Contact her at kcapps@newsminer.com, in the office at 459-7546 or by cell at 322-6334. Follow her on Twitter: @FDNMKris.

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FAIRBANKS — A panel of experts will meet Friday to discuss how climate change affects the Alaska economy and how that economy might need to change.

It is a conversation organizers say needs to happen in this time of rapid climate change and unstable oil prices.

“Alaska needs a real transition plan in order to build a new economy,” according to the news release announcing the special panel, which meets 12-1 p.m. Friday at the IBEW Local 1547 office, 2000 Airport Way.

Panel speakers include Brian Cladoosby, president of the National Congress of American Indians and president of the Association of Washington Tribes; Sam Alexander, University of Alaska Fairbanks economics instructor and Alaska Native business leader; Jackie Schaeffer, senior project manager Alaska Native Tribal Health Consortium, Division of Environmental Health and Engineering; and Easau Sinnok, Shishmaref Youth Leader and UAF student.

The panelists will highlight community-based solutions that focus on equity for all, including Alaska’s workforce. A discussion will follow that will include the audience. Invitations have been extended to political candidates, according to the announcement.

“Alaska needs a new economy,” according to the news release. “Not only does climate change demand it but the future sustainability of our economy demands it.”

The panel will talk about some of the “new economy” work being done and will address the need for building a statewide plan for an environmentally and economically sustainable transition.

“Future generations of Alaskans deserve a sustainable future,” panel moderator Princess Johnson said. “This discussion is long overdue.”

Sponsors include the Fairbanks climate Action Coalition, Native Movement, UAF Native Student Union, Northern Alaska Environmental Center and Citizens’ Climate Lobby.

**Catch of the Season**

The Catch of the Season, by the Alaska Marine Conservation Council (AMCC), is once again offering seafood shares to Fairbanksans. This is a program that connects Alaskans with sustainably sourced seafood from local small boat fishermen.

It was first offered here in 2015 and was so successful, it’s continued.

“The entire community has been extremely supportive and we really appreciate the love from Fairbanks,” said David Fleming, the new seafood sales/operations manager at AMCC.

Four types of seafood can be ordered by Oct. 28 for delivery the first week of November: Norton Sound Seafoods red king crab, Kodiak Jig Seafood rockfish, Kodiak Jig Seafoods Pacfic cod and coho calm on from Taku River Reds.

The seafood is delivered with information on where it came from and who caught it. The buyer gets a complete “story of your catch.”

For information on pricing and ordering, see www.ak

[marine.org](http://marine.org/) or call 277-5368. You can also order online at <http://bit.ly/2ekpiHb>.

**Landscape design**

Fairbanks Garden Club is offering a Landscape Design School on Saturday and Sunday at the Noel Wien Public Library.

This is the second course in the club’s winter design school, but you don’t have to attend the first to sign up for the second.

Professionals will lead the sessions, but will gear them toward the ability and experience of those who attend, said Becky Hassebroek, of the nonprofit Fairbanks Garden Club. The training also will be applicable to gardening in Interior Alaska — “which is wonderful,” Hassebroek said.

Document 38

Above the Arctic Circle, climate change closes in on Barrow

* Adam Popescu, Special to The Washington Post
* Sep 12, 2016

BARROW, Alaska — Here in the northernmost municipality of the United States, 320 miles above the Arctic Circle, people are facing the idea that they may soon be among the world's first climate-change refugees.

Warming air, melting permafrost and rising sea levels are threatening their coastline, and researchers predict that by midcentury, the homes, schools and land around Barrow and its eight surrounding villages will be underwater. This despite decades of erecting barriers, dredging soil and building berms to hold back the water.

"The coastline is backing up at rates of [30 to 65 feet] per year," says Robert Anderson, a University of Boulder geomorphologist who has studied Alaska's landscape evolution since 1985 and who first noticed in the early 2000s how alarming the erosion was becoming. "It's baffling."

When the sea ice melts, the coast becomes exposed to waves, wind and storms that slam into the shore, causing erosion. As ice moves farther from shore, waves can be as high as 20 feet when they reach land, Anderson says.

"The only thing we can do, as far as I'm concerned, is move our towns inland," says Mike Aamodt, the former acting mayor of Barrow and its surrounding villages of the North Slope Borough, which stretches over 89,000 square miles, an area larger than Utah.

Pointing out a window in his second-floor office, Aamodt isn't joking when he declares that the sole refuge from erosion and rising seas is the Brooks mountain range — more than 250 miles south.

Barrow, with a population of just over 4,000, is as remote as it gets. There are no roads leading in, and it's accessible only by air and, during the summer months, by sea. There's a post office, a police station, a fire station and a high school with an indoor track and a swimming pool for its 200 students, plus a rec center, a 14-bed hospital, a few churches and a handful of mom-and-pop restaurants. There's no movie theater for 1,000 miles, no bars (or legal alcohol sales), no nightlife to speak of.

There are oil fields 200 miles to the east in Prudhoe Bay, but aside from a few corporate logos on buildings, there's no sign of Big Oil in town. Most visitors come here to experience the stark beauty and power of nature — seas so iced-over in winter that you can walk on them for miles, tundra brown and green in summer, and the stunning variety of animals, including whales, seals, caribou, polar bears and walrus.

Scientists flock here to study climate change. Low temperatures average nearly 20 degrees below zero in winter; summer highs are mostly in the 40s, though it reached 79 once in 1993. Locals — and hard data — say there's less snow and ice now than ever before.

The area has long been home to Inupiaq natives who have lived off the abundant marine life. Modern Barrow was built on commercial whaling in the late 1800s, but there's evidence of indigenous settlements going back as far as 800 A.D. The giant bowhead whales native to this part of the Arctic are actually prospering with warming seas here. But it's a different question for the humans.

A stroll along one of Barrow's handful of roads shows just how tenuous civilization's perch is. Bulldozed mounds of sand and soil more than 20 feet high are all around town. But these sea walls are frequently penetrated as swells and storms overtop the walls, sometimes sending houses, built on stilts because of the impenetrability of permafrost, floating inland for miles.

With ocean to the north and half a dozen major lagoons and lakes to the south and east, Barrow's residents face danger on all sides. Yet the biggest worry may be from the ground itself.

"Sometimes I have that eerie feeling — I'm, like, 'Oh gosh, we're on the permafrost,' " says Diana Martin, a Barrow-born Inupiaq who works in the town's museum, over a bowl of caribou soup at her sister's home about a mile from the coast. "What if we start floating away?"

Science backs up her concern: This year is on pace to be the hottest on record.

As air and sea temperatures have notched up, there has been a warming of the permafrost, the thousands-of-years-old subsurface layer of frozen soil, rocks and water. That layer can be as much as 2,000 feet deep in parts of this area.

Gary Clow, a U.S. Geological Survey geophysicistwho has spent 30 years measuring temperature here, says permafrost has warmed about 5 degrees since 1990. That makes soil soften, rise and shift, which Aamodt says affects everything that has been built on it: utility systems, roads, airports.

It's a change Aamodt fears: If fuel dumps or sewage lines leak into freshwater sources, major pollution ensues. With hundreds of miles of coast not many feet above sea level, the potential impact on health and lives is great.

When cyclones came through in 2000 and 2004, knocking out Barrow's power supply, the result was flooded and contaminated drinking water. States of emergency are common occurrences here, and given the rising seas and coastal erosion, every year brings the threat of a storm that could wipe the town off the map, Aamodt says.

Barrow's climate-change problem has been years in the making, says Anne Jensen, an ethnographic archaeologist who arrived in Barrow in 1983 and has been excavating some of the earliest human settlements found in this frigid area.

The increasing floods and erosion have made her job a scramble against nature. By the time she secures funding and gets ready to enlarge a dig, a site that is often now at water's edge, surging oceans washes everything away. It's a frustrating way to make a living, she says. "The entire north coast of the North Slope — most of the sites are already gone. We have a big knowledge gap up there."

Faced with what they see as the inevitable, some people have begun relocating inland. Aamodt has moved his hunting cabin six times since the 1970s. When we speak, he shakes his head, wishing that it would be as easy and affordable to pick up and move Barrow and its neighboring communities.

Moving any one of these towns, though, would require more resources than the state or federal government would be willing to provide, he says. Relocation is already being planned in other parts of Alaska, including one town 400 miles south of here on the Bering Sea. And although President Barack Obama has earmarked hundreds of millions of dollars to help communities facing the impact of the changing climate, that won't be enough, Aamodt says.

At $403 million, the borough's annual budget ‚ much of it funded by a tax on oil and gas development in Prudhoe Bay — sounds enormous, but it's only enough to keep these far-flung hamlets going in their harsh environment.

One of Barrow's nearby villages, Point Lay, "is [a mere] 400 people, 40 houses, big buildings, an underground utility system, pipes," he says. But it's "probably $500 million to move that town. Then we have Wainwright: We need to move that town, too. It's on a bluff right against the ocean. That's 700 people, so I imagine $700 [million] to $800 million."

Aamodt takes off his glasses, then stares out the window toward the sea, quite calm on this afternoon. There's no magic rescue, he says. There's not even a Coast Guard outpost here should watery disaster strike: The closest is 1,000 miles away. Locals, known for extreme self-reliance, feel as if they are being left on their own to face a future as refugees from climate change.

Can these towns be saved? Aamodt fidgets in his seat, looking down. "It's fruitless to even think about it," he replies. "Our turn is coming. That could happen this year. It's inevitable."

Document 39

As governor, Sarah Palin believed in climate change

* By Rick Steiner
* May 20, 2016

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**News-Miner Community Perspective:**

Since her meteoric rise to fame in the 2008 U.S. presidential campaign, former Alaska Gov. Sarah Palin has been a leading voice in the climate change denial movement. Celebrity and ignorance are a dangerous mixture.

Ms. Palin claims that climate change is a hoax, snake oil, junk science and a left-wing conspiracy to shut down development. After a late season snowfall in southern Alaska in 2013, she wrote on her Facebook page: “Global warming my gluteus maximus.” And Ms. Palin is now using her tabloid, televangelist fame to promote the most recent climate change denial effort, the flagrantly inaccurate film “Climate Hustle.”

But surprisingly, Ms. Palin wasn’t always a voice of ignorance on climate change. Before she went down the Tea Party rabbit hole in 2008, into the fantasy world of climate change denial devoid of fact, science, or reason, Palin actually believed the science of climate change and the necessary governmental response.

As governor of Alaska in 2007, she issued Administrative Order No. 238, establishing the Alaska Climate Change Sub-Cabinet, which she tasked with developing and implementing an Alaska Climate Change Strategy. This is some of what Gov. Palin stated in that order:

“Scientific evidence shows many areas of Alaska are experiencing a warming trend. Many experts predict that Alaska, along with our northern latitude neighbors, will continue to warm at a faster pace than any other state, and the warming will continue for decades. Climate change is not just an environmental issue. It is also a social, cultural, and economic issue important to all Alaskans. As a result of this warming, coastal erosion, thawing permafrost, retreating sea ice, record forest fires, and other changes are affecting, and will continue to affect, the lifestyles and livelihoods of Alaskans. Alaska needs a strategy to identify and mitigate potential impacts of climate change and to guide its efforts in evaluating and addressing known or suspected causes of climate change.”

Palin’s 2007 climate change order directed her new sub-cabinet to, among other things, focus efforts on the following:

“The prioritization of climate change research in Alaska; development of an action plan addressing climate change impacts on coastal and other vulnerable communities in Alaska; policies and measures to reduce the likelihood or magnitude of damage to infrastructure in Alaska from the effects of climate change; the potential benefits of Alaska participating in regional, national, and international climate policy agreements and greenhouse gas registries; the opportunities to reduce greenhouse gas emissions; and the opportunities for Alaska to participate in carbon-trading markets, including the offering of carbon sequestration.”

At that time, Ms. Palin seemed a true believer in the science, impacts, risks and necessary responses to climate change. In fact, Palin’s Climate Change Sub-Cabinet did some excellent initial work on the issue and developed a robust Alaska Climate Change Strategy.

Then came her trip down the rabbit hole in 2008, where she and her supporters have been stuck ever since. Her adoring fans wanted to be told a fairy tale on the climate issue, and she has been more than willing to oblige.

Of course since that time, climate change has gone from bad to worse in Alaska. Unfortunately, these earlier efforts to address the issue here have been entirely ignored in the oil politics of Alaska today. Although Palin’s administrative order is still on the books, Gov. Sean Parnell ignored it entirely — as has Gov. Bill Walker, so far.

It may be too much to hope for, but on an issue so dangerous to the future of human civilization and the biosphere, it would be wonderful if Ms. Palin would come back into the light of science and reason and re-join society’s urgent fight for climate stability, reduced carbon emissions, clean energy and a sustainable future. Regardless, it is long past time for Gov. Walker to attend to this issue with the urgency it demands.

*Rick Steiner was a marine conservation professor with the University of Alaska 1980-2010, stationed in Kotzebue, Cordova, and Anchorage. Today he is a conservation advisor through the nonprofit advocacy group Oasis Earth.*

Document 40

An oilman's $7 billion lesson in the economics of climate change

* Steven Mufson, The Washington Post
* Mar 11, 2016

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PHILADELPHIA - Marvin Odum, president of Shell Oil, was attending a meeting of the parent company's executive committee in Singapore when word trickled in that an exploration well drilled in Alaska's Chukchi Sea - the crowning step in a multi-year $7 billion quest - was a dry hole.

Maybe not bone dry. In a recent interview, Odum wouldn't say. But in the oil business glossary, a dry hole is one that can't pay off commercially, and Shell's hole definitely qualified. The parent company, Royal Dutch Shell, abruptly dropped any further drilling - a setback for the industry, though a relief for environmentalists.

For years, they had fought a vigorous, litigious and politically intense battle over the Chukchi. Meanwhile Shell, lured by potentially rich rewards, had overcome a couple of embarrassing rig mishaps at sea and patiently navigated the courts and the Obama administration's permitting process. Now, geology had rendered its verdict.

Odum, who subsequently announced that he would be retiring at the end of this month, said the news about the well didn't hit all at once, but that the drilling results and analysis came in small, painful drips over several days of the executive committee meeting.

Odum knows all too well the element of chance that drives the oil-drilling business. The mechanical engineer has spent his entire 34-year working life at Shell and has overseen successful exploration in the Gulf of Mexico and elsewhere. (About a third of Shell's capital spending goes to North America.) The tools of the trade have grown more sophisticated over time, with computer-aided seismic surveys that can give exploration companies detailed three-dimensional, multicolored maps of the subsurface. Still, at the end of the day, there is only one way to find out for certain whether oil or natural gas is lurking deep in the Earth.

"Through geology and seismic surveys, we had reduced the risk to where the only way to reduce it more was to put down a well," Odum said, adding that Shell put it "where we thought there was the highest prospect" of a discovery. If they had been correct, Odum said, the reward could have been fields as rich in oil as the Gulf of Mexico, which produces 1.6 million barrels a day worth $22 billion a year, even at today's depressed prices.

"The size of the prize was always big enough to take that next step and find out for sure," he said.

Odum took time to reflect during a recent visit to the University of Pennsylvania's Wharton School. Odum's departure has saddened many at Shell who see him as, well, a nice guy. He says now is a logical time to leave Shell, which hired him on the spot during the one and only job interview of his life. His father also did some work for Shell, devising a specially fitted type of steel pipe that made drilling easier - and which NASA later used, too.

But now, Royal Dutch Shell is undergoing a massive reorganization to gird itself for a more climate-conscious world, but one that Shell says will still need vast quantities of fossil fuels.

With the recent $52 billion acquisition of the British BG Group, Royal Dutch Shell is making liquefied natural gas a bigger part of its future. It also picked up alluring deepwater oil fields off Brazil. It has reorganized its lines of management by function, rather than geography. And it is planning to sell $30 billion in assets over the next three years, twice the normal rate.

That could include some items in North America.

To many analysts, it looked like Odum was pushed into leaving. "He's a very competent guy. Very low key and sure of himself," said Fadel Gheit, oil analyst with Oppenheimer & Co. "But unfortunately for him, the results were pretty bad. It's basically on his watch."

Gheit said the drilling rig mishaps at sea cost hundreds of millions of dollars and, back on the mainland, Shell had to write down the value of shale oil and gas properties. But, he added, these setbacks were "not entirely his fault."

Odum says that while he's not rushing into anything, he plans to find new work in the oil business. He also plans to spend more time with his new grandson, his golf clubs, his cello (an eight-year-old Christmas present he's just learning) and his three motorcycles - a Harley-Davidson, a BMW and a Ducati. "I love riding. It's the engineer in me," he said.

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The night before Odum arrived at the University of Pennsylvania, students from the Penn Sustainability Review, an environmental publication, met to figure out how to pressure the university into selling the endowment's investments in fossil fuel companies.

Last year, 88 percent of Penn undergraduates who voted in a referendum favored divestment from fossil fuels. (A third of undergraduates voted.) Similar measures are sweeping across college campuses, efforts that in some ways resemble the anti-apartheid disinvestment campaigns aimed at South Africa.

Fossil Free Penn, which launched the referendum, has called for the university to stop new investments in the fossil-fuel industry, sell off holdings in the top 200 fossil-fuel companies within five years and reinvest a portion of the funds into renewable energy.

The group estimates that 4 percent of Penn's $9.6 billion endowment is invested in fossil-fuel companies.

Royal Dutch Shell is a big target not only because it produces oil and gas to satisfy global demand, but also because of its record in places such as Nigeria's Niger Delta, where thieves and local insurgents frequently siphon oil from pipelines, sometimes causing leaks or explosions. Community leaders and environmental groups have accused the company of ruining the environment; the company has been selling or reducing its troubled operations onshore and sticking to those offshore.

And in the United States, the push to drill in the Alaskan Arctic drew sharp opposition. Under Odum, "the company consistently demonstrated a lack of preparedness and a willingness to push the limits of the law, technology and common sense," said Michael LeVine, a lawyer with Oceana, which opposes all offshore drilling. "Shell's misadventures in the Arctic Ocean should serve as a cautionary tale for other oil companies considering investments in remote and dangerous places."

If ever the oil industry needed a human face, however, Odum has been it, representing Shell in a coalition that supported the Obama administration's cap-and-trade climate strategy back in 2009.

At Penn, he said the Obama administration's Clean Power Plan - which would favor gas over coal - was "not perfect, but it's a good reasonable place to start" and he was "supportive." He said he would prefer an economy-wide carbon tax if it were ever politically feasible, even though it would raise retail prices of oil products.

"I intellectually understand it," he said during a class in which a student asked about the divestment movement. "If your point is to divest from fossil fuel companies, just be very clear what you want to accomplish. If it's a symbolic move - 'we want to voice our position' - I say, 'fine.' I'd much rather say there is an opportunity here, particularly with companies like Shell, to co-create a solution with a company that deeply understands energy markets."

Odum said, "The idea that you can turn fossil fuels off and other sources on and all will be well in 10 years, it's just wrong."

He said, therefore, that "if you're going down that route [toward divestment], then I would ask you to look at differences between companies out there. I think we're trying to do the right things."

Shell has long basked in a bit of climate-sensitive sunshine because of Odum's revelation (at a Washington Post event) that the company factors in a $40-a-ton carbon price when it does the economic analysis on a new project, an adjustment that would penalize proposals that are the worst from a climate change point of view. Asked about the Paris climate accord, he said "we will never get this transition going at the pace people want without a price on carbon."

A Penn professor had an astute question: Does Shell assign a carbon price only to the energy the company uses to extract oil or gas? Or does it apply the price to the end use on all oil and gas found?

Odum clarified that it applied only to the amount used in extraction - a tiny sliver of the overall climate impact of a project.

Odum deflected a question about whether Shell should use part of its huge annual capital budget, now about $33 billion after the BG merger, to promote renewable energy. He said that shareholders of a company like Shell might prefer if Shell stuck to what it knew - finding oil and gas - and let shareholders take other money and invest it in firms specializing in renewable energy.

Divestment is not the only hot-button issue at the University of Pennsylvania. When Odum arrived earlier in the day at the Wharton School's radio station to do an interview, the producer offered to screen out callers who were particularly irate about shale gas drilling, which has been a huge issue in Pennsylvania, where many residents say wells have contaminated drinking water.

Odum told her not to worry. And when the subject didn't come up, he brought it up himself.

"What's happened in the back yard here in Pennsylvania has changed the world," Odum said of the giant Marcellus gas reserve in the state that has lowered prices and made it possible to replace dirty burning coal-fired power plants with gas-fired ones. But he added, "there is a right way to develop this gas" and then there are the pollution hazards residents worry about. "Those are not difficult problems to solve," he said. Shell is part of a group of companies cooperating with the Environmental Defense Fund to measure potent methane leaks that could negate climate benefits of burning gas instead of coal.

"I come out in favor of very clear, very strong regulations," Odum said. "From the perspective of a company like us, it protects us because everybody then has to do it the right way."

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But most of the students who saw him in a classroom, and later at an open event, zeroed in on business decisions steered by the price of oil, which has tumbled about 70 percent since July 2014. Shell has slashed capital spending to about $20 billion from about $35 billion, and it has shelved its planned Carmon Creek oil sands project in Canada. Instead of exploring for shale oil in two dozen basins, he said the company is down to six "sweet spots."

"We're in a commodity business, and when you're in a down cycle, everything is difficult to decide," he said. "You've got to keep your balance sheet strong. Not just to remain solvent but able to make strategic moves when everyone else is suffering."

When deciding on a project, he said, Shell looks at its economics, its "resilience" if economic conditions go bad, political factors, country risk and environmental issues. He said that before the steep price drop, Royal Dutch Shell had been weighing on six or seven big projects a year, but in the past year had signed off on only two.

"You don't make multibillion-dollar choices lightly," he said, when asked about his toughest decisions.

"I could pick an easy one: Alaska. We spent many billions of dollars exploring off Alaska," he said, "but the final answer comes from the drill bit when the oil that we needed for it to be viable wasn't there."