

Alaskan Energy Issues

By Douglas B. Reynolds*

Editor's note: The 32nd Annual North American Conference will be held July 28-31 in Anchorage, Alaska at the Hotel Captain Cook. This will be the first time the North American Conference has been held in the U.S. but outside the lower 48 states. Doug Reynolds, a long-time IAEE/USAAE member and an Alaskan resident, tells us what it's like to live and work in a place where temperatures reach 40 below and what you'll be missing if you don't make the effort to attend this meeting.

For those of you thinking of coming to Alaska for the 32nd Annual IAEE North American Conference in Anchorage, Alaska, let me take a moment to welcome you to Alaska. Alaska is big, it is beautiful and it has some of the most incredible energy issues of anywhere in the world. If you love energy, nature and the “Last Frontier,” then do not miss this conference. However, if you come to this conference, you will come in the summer at a beautiful time of year when most of the energy issues we deal with are not so apparent. In that vein, here is an explanation to help you understand some of the unique energy issues we grapple with here in Alaska, and specifically in Fairbanks, Alaska, the rest of the year.

A word to the wise, for those of you in Europe: one airline, Condor Air, offers a weekly flight direct from Frankfurt, Germany to Fairbanks, Alaska, and Anchorage, Alaska. Condor also offers connecting flights from everywhere in Europe to Frankfurt via Lufthansa. So come early or stay late for the conference, or even why not make a month out of it? Enjoy the many sights, go fishing, biking, canoeing, boating, mountain climbing or heli-skiing. If you come up to Fairbanks, I will introduce you to energy research facilities at the University of Alaska Fairbanks, and invite you in to see my coal boiler used for space heat. You can rent a car and stay at camp sites all over Alaska. You can try some muktuk if you're lucky, reindeer sausage, grilled “wild” Copper River salmon, or even some halibut or moose. Also Santa Claus can be visited year round in North Pole, Alaska, which oddly enough is just south of Fairbanks.

Unfortunately, the Northern Lights are not visible in the summer as the Midnight Sun hides their colors, but Denali (Mt. McKinley) can be visited as can many other amazing places. For those of you who wonder how it is the rest of the year here in Alaska, here is a taste¹:

In the 1970s, I knew energy was the key to the world's future, and I assumed like most economists that new technology would come to the rescue. After all, we know that necessity is the mother of invention. I have now come to a very different conclusion: rather than invention, necessity is the mother of adaptation, and counting on technology to solve a crisis is at best a fifty-fifty proposition. But counting on adaptation to solve a crisis is 100 percent reliable. Adapt and thrive. So, I took it upon myself to adapt ahead of time and find the most successful strategy to use less oil, partly as a research experiment, partly to make a significant lifestyle change at my own pace, and partly to explore a new future.

When I got to Fairbanks, Alaska, I initiated a personal search for ways to use less oil. As it just so happens, Fairbanks is one of the most perfect places in the world to carry out just such an experiment simply because the Fairbanks economy is intensely dependent on oil. Not only is there a major oil pipeline and refinery near town, but also the majority of residents use fuel oil to heat their homes and consume gasoline to drive their cars to work and around town. However, contrary to what you might expect in an oil producing state, Fairbanksans pay more for gasoline than most Americans even with a refinery nearby. Additionally, the town is heavily dependent on tourism and mining for employment—industries which rely on cheap oil fuels to transport tourists, employees, and machinery. According to the weather service, we have 100% probability of snow on Christmas. So, how to adapt?

On a cold day in Fairbanks, it can reach 40 below zero (Fahrenheit or Centigrade) and be pitch dark. The sun doesn't rise until midmorning. In spite of this, I have managed to bicycle to work nearly every day to save fuel and money. I wish I could tell you of the beautiful snowy scenery I pass on the bike path and along the river, or of the ways a simple black spruce looks covered in snow, where the best thing is that the snow makes even a dark early morning seem brighter than you'd expect, but really it's a tough ride. I wear heavy snow pants, a parka, gloves, boot gloves, a face mask, and a helmet fitted for ear warmers. I also have studded bike tires, which cost more than studded automobile tires. I have two front head lights, one on my helmet and one on my bike handle bars, as well as front blinkers, and I have two blinker lights behind me and reflective tape all around; yet still drivers do not always see me.

As I roll along, the cold is often so bitter, that my tires actually begin to flatten as the cold reduces tire pressure. I have to make sure that the tires are pumped

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See footnote at end of text.

to at least 60 psi (4 bars) or they become so pudgy and resistant to motion that it takes twice as long as normal to get to work and I become worn out. Also as I go, my breath fogs up my face and freezes so that ice begins to build up around my eyes, but I have found it impossible to wear goggles or glasses because they fog up instantly and you can't see. One of my graduate students found a solution, though, using snorkeling gear. Needless to say my eyelids and face freeze over a little, and I look strange as I come in from the cold with ice all over my face and eyebrows.

As far as using my bike for other needs, I don't ride my bike to the store or take my kids in my bike trailer in the winter. Besides the severe safety issues of being hit by an on-coming car were I to ride my bike in the dark with kids in the back trailer, my kids would complain the whole way and possibly suffer frost bite if they had to ride very far in 40 below weather. I do know a mom who manages to bike her kids to pre-school in winter here, but for most people bicycling just isn't a viable alternative to a car.

One winter, I had a different challenge as far as commuting was concerned. I did some consulting in downtown Fairbanks, so I had to be in several places around town during the week which meant I couldn't ride my bike as easily. I would put in 40 hours a week at the university and then 20 hours at consulting. I ended up taking the bus to the university and then another bus to the downtown consulting and then sometimes back again to the university before going home. Unlike Europe or the rest of the world, though, most bus systems in America leave a lot to be desired. The main problem is that Fairbanks is not a large community. Few people rely on the transit system, so there is no need for lots of buses. Even so, the lack of buses was easy to solve.

First I would go out and wait for the first bus from my home in 40 below weather wearing all my winter clothing. There was about a 40 minute delay between the bus to campus and the next bus to downtown, so I had time to run to my office, check my email, and to try to take care of campus business before I ran—and I mean ran fast—to the next bus. Once I caught the downtown bus, I rode to my consulting office.

During the long leisurely 25 minute ride to downtown, I used the time well. I read reports, graded papers, or wrote analyses. I could have focused on the "time waste" factor since I could have covered the same distance in fewer than 10 minutes by car door to door; but instead, I came to realize that efficiency wasn't about how my environment caters to my needs, or about finding technology that adapted to what I needed, it was more about how I adapted to my environment and the existing technology. Often a passenger on board would say to me, "Wow, that sure is a long report you're reading," or "That sure is a lot of grading you have to do," and they would ask for more details. So sometimes I got work done on the bus and sometimes not, but there was a sense of community that I don't get alone in my car which in many ways made up for the downsides.

Another energy problem that all of Fairbanks and other cold climate challenged cities face is the high cost of heating. Most people in Fairbanks use fuel oil to heat their homes, a very expensive fuel, and the bills are dragging many folks under. I, too, used to heat my home with fuel oil and sometimes wood. However, I wanted something cheaper realizing that I was one of the few who saw the future and the difficult changes that people were soon going to have to make. Sure, I added insulation to my house and participated in weather-proofing programs offered by the state, but quite frankly in Fairbanks that just isn't enough. Luckily there is a world class coal mine a hundred miles southwest of town by rail, which offers Fairbanks access to cheap coal land that led me to buy a coal-fired, hydronic boiler for my backyard.

This coal system automatically feeds coal to a burning chamber every time extra heat is called for by the house. It was expensive, well over \$15,000 dollars after all the installation, but the reduction in fuel costs have made up for that. After all, I knew of another energy conscious professor who spent somewhere over \$30,000 to better insulate his house and save money. So I spent less initially and expect to save more annually.

The interesting thing about Alaskan coal is that it is sub-bituminous, low grade coal, because it is a "younger" coal and still has much water within it. This has a disadvantage, however, as the coal is of a lower energy content per pound, although it is cleaner to burn than anthracite coal, like that found in West Virginia, because the Alaskan coal has less sulfur. However, Alaskan coal cannot be burned in an indoor coal stove as easily as anthracite coal. It works best burnt in a separate outdoor boiler where coal dust can be contained and the burn temperature can be kept high. The thing of it is, while fuel oil is delivered at close to \$4 per gallon of gasoline equivalent (GGE) as of this writing, coal is deliverable at about \$1.50 per GGE. Even though the coal does not burn as efficiently as fuel oil, it still saves half the energy cost of fuel oil.

I eventually added an insulating shell around the boiler to reduce the need to fill the coal bin and haul

away the ash as often, and I heightened the chimney to make it more efficient and even cleaner burning. In fact those changes made the boiler about twice as efficient and half as smelly. The only big problem I experienced was on a New Year's Day when I had to work outside at 40 below for four hours to loosen the auger mechanism. While most people have not gone to the lengths I have to deal with our energy crisis, many folks have indeed recognized that they are going to have to take steps down that path.

I sat on a committee for energy options in Fairbanks in 2008 to discuss these looming concerns of expensive heating fuel oil coupled with an extremely cold, stagnant atmosphere in the winter with temperature inversions. The temperature inversions cause coal and wood burning particulates as well as pollutants from vehicle exhaust and diesel buses (though not the downtown coal power plant that has a scrubber to clean the particulates) to remain in the atmosphere close to the ground where we breathe them in. The particulate matter from wood and coal and the myriad of other pollutants creates particles as small as 2.5 microns that have been shown to be unhealthy. Yet, with fuel oil so expensive and with natural gas unavailable in Fairbanks, the only cheap heating options available are those which pollute—wood or coal. The question for the committee was, what if most every family in Fairbanks were forced by the high cost of energy to rely on wood or coal heat? Clearly particulate matter would be horrendous. Thus, the entire town sits on the front lines of the world's energy and environmental crises. Some residents have already chosen, and soon others will choose, to switch from fuel oil to coal boilers or wood stoves. Others will continue to pay extremely high fuel oil prices which are reaching and exceeding \$5,000 a season.

So the committee for energy options advocated bringing natural gas to town. Three options were vetted. One was the construction of a small diameter natural gas bullet pipeline from Prudhoe Bay to Anchorage, which would go past Fairbanks and provide relatively cheap natural gas for both major metropolitan areas. That could take six years from start of construction to finish. Another option was to put super cooling liquefied natural gas (LNG) modules on the North Slope, turn the North Slope's natural gas into LNG and then truck the LNG to Fairbanks, which would take two years of development. A third option was to drill for natural gas about a hundred miles west and build a small eight-inch pipeline from there to Fairbanks. That would take three years, if they found natural gas, which they haven't.

One other option that was discussed was to use the heat from our downtown coal fired power plant to warm up homes and businesses—district heating. Already hot steam and hot water from the power plant is piped around the Fairbanks downtown area in order to heat houses and buildings—often called cogeneration. The problem is many more houses could use that heat source if more pipes were laid, but our commission determined this alternative to be too expensive. A cheaper alternative, which I saw used in the former Soviet Union, was to put pipes above ground rather than underground all over the city. It's ugly, but cheap. The Soviets did it often.

In the end it was up to the various financial and commercial interests as well as the more politically powerful Anchorage metropolitan area to determine which option would materialize. A recommendation for the two year LNG option was pushed, but because the commercial interests needed time and incentive to try their options, nothing was done with the recommendation. Fairbanks lost a year of time and headed into greater environmental and economic decline, but that is typical. Energy transitions by their nature are divisive, expensive, and economically devastating. There are no easy technologies, no cheap solutions, no clear path—only extremely difficult and painful adaptations. (to bring you up to date, it is now 2012 and still none of these options discussed above have materialized in Fairbanks)

You'll be wondering why I haven't mentioned the golden boys of the energy debate, "alternatives." Our local energy committee did in fact look at some other interesting options for Fairbanks, such as solar, wind, geothermal and nuclear power. Most of these don't adequately address the heating needs of Fairbanks because they just can't work here. A small scale "micro-nuclear" plant option would take five to ten years to permit and again would not address the heating needs of Fairbanks. In the end various and obscure ideas only heightened the realization that no energy resource worked nearly as well as oil. But more critical is that if you view Fairbanks as a microcosm of the world, the world's economies are on a path to energy crisis just like Fairbanks. No one on the committee liked the idea of coal boilers, but they realized more houses would soon be making the switch to the detriment of the Fairbanks air quality as was the case when wood and coal were the Fairbanks fuels of choice and necessity 70 years ago. A similar reality confronts the world as it inevitably chooses coal and the consequential global climate change results.

Alaska did conduct a program to add insulation and sealing to houses. I participated, and sure enough after I added insulation and sealed it up, my indoor humidity levels skyrocketed and I got iced windows and the beginnings of mold problems. So I have intentionally reinstalled air leaks. There are systems

you can install called Heat Recovery Ventilators (HRVs) in use in Fairbanks and elsewhere, but bear in mind that these cost thousands of dollars to install and use energy themselves, making the ultimate costs high.

These anecdotes suggest that there are no easy answers to high energy costs. People will simply have to pay more for energy including electricity and will have less money for vacations, for recreational equipment for consumer goods, and even for necessities. These are the hardships we face.

Rather than waiting for that man-on-the-moon technological breakthrough or the perfect hydrogen fuel cell car, it is better to just go ahead and start right now to change your lifestyle. Prepare to change your job, prepare to accept lower wages, prepare to live in a house with other families, prepare to use alternative transportation, or prepare to use coal to heat your home; just don't prepare for the easy life that technologists have promised.

Ultimately, people will make do. We were made to adapt. Americans and people around the world survived the Great Depression, world wars, and other atrocities and crises. Now people will have to manage again and with environmental problems to boot. This is not a statement on the ways in which you will have to adjust, but a statement on the likelihood that you will be forced to adjust. When I taught in Kazakhstan, a student told me, "It could be fun for everyone to live in a yurt." And so it will be. Just remember to wear your reflective gear and smoke respirator safety mask and be prepared for a different way of life.

Now here is my challenge to you: attend our July 2013 IAEE conference and take time to ask the Alaskans you meet about energy.

Footnote

¹ Portions of this are excerpted from Reynold's book, *Energy Civilization: The Zenith of Man*.

Welcome to IAEE's Newest Institutional Member

IAEE is pleased to welcome Singapore's Energy Market Authority as an Institutional Member. The following profiles EMA and some of its activities.

The [Energy Market Authority \(EMA\)](#) is a government agency under the Ministry of Trade and Industry. Our main goals are to ensure a reliable and secure energy supply, promote effective competition in the energy market and develop a dynamic energy sector in Singapore. Through our work, we seek to forge a progressive energy landscape for sustained growth.

EMA organises the annual [Singapore International Energy Week \(SIEW\)](#). This is an event which brings together the world's leading conferences, exhibitions, workshops and networking events from across the energy spectrum of oil & gas, clean and renewable energy, smart grids and energy trading - in one week, in one location. The 6th SIEW will be held from 28 October – 1 November 2013.



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