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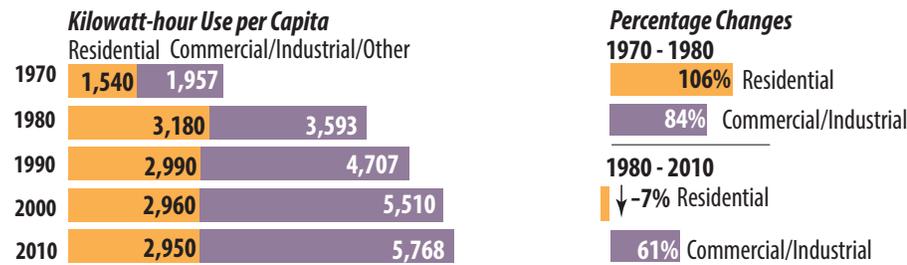
Electricity in Alaska: A Growing and Changing Picture

By Ginny Fay and Alejandra Villalobos Meléndez

You might think Alaskans are using more electricity at home now than they did in 1980, since many live in bigger houses, own more appliances, and have computers and other electronics that were rare 30 years ago. But you'd be wrong: per person residential use of electricity is actually a bit lower today—probably due to a combination of more efficient appliances and increased conservation, as energy prices rose. What did jump sharply was commercial and industrial use per person, reflecting the major economic growth that in recent decades has made Alaska's economy far bigger and more diverse.

This summary shows changes over time in use of electricity in Alaska and describes the current picture, including use by region and sources of electricity—especially renewable sources. More details are available in a longer report (see back page).

Figure 1. Changes in Per Capita Use of Electricity in Alaska, 1970 - 2010



Sources: U.S. Department of Energy, Energy Information Administration; Alaska Energy Authority, Power Cost Equalization program data; authors' estimates

- **Total per-person use of electricity (residential and other) in Alaska doubled between 1970 and 1980** (Figure 1). In that decade economic growth related to oil development started, and many remote communities got their first central electric utilities.

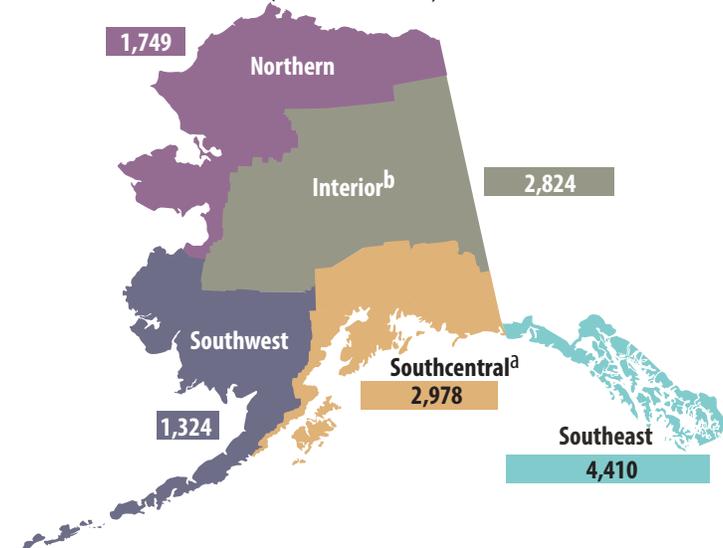
- **After 1980, economic growth continued to drive commercial and industrial use**, but residential use per person flattened, despite big changes in the size and variety of home appliances and electronics.

- **Alaskans in remote areas that generate electricity with fuel oil use less than half the electricity per person** as those with access to less expensive fuels. Parts of South-central Alaska use natural gas to generate electricity, and some communities in Southeast have hydropower.

- **Consumption is lowest in the Southwest region, which relies almost entirely on fuel oil.** In the Northern region, two communities have access to natural gas. Per capita use in the Interior is boosted by higher use in Fairbanks, but use is lower in outlying places (Figure 2).

- **Alaskans use about a third less electricity per capita than the average American**, in part because Alaskans don't typically need air-conditioning.

Figure 2. Per Capita Residential Use of Electricity, by Region of Alaska, 2011
(In Kilowatt-hours)



^aAnchorage/Mat-Su and Gulf Coast census regions; it's not possible to use utility-level data to make separate estimates for these areas.

^bIncludes Fairbanks, where per capita use of electricity is significantly higher than in other communities in the region.

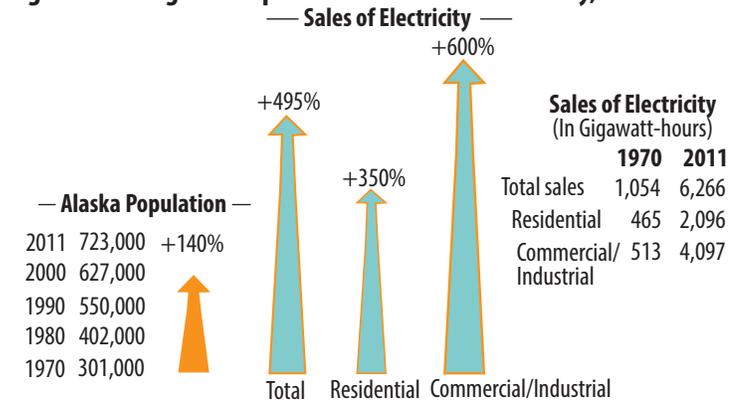
Sources: Sources: U.S. Department of Energy, EIA; Alaska Energy Authority, PCE program data; authors' estimates

Figure 3. Per Capita Use of Electricity, (Residential and Other) Alaska and U.S., 2010
(In Kilowatt-hours)



Sources: U.S. Census and authors' estimate

Figure 4. Changes in Population and Use of Electricity, 1970 - 2011



Sources: Sources: U.S. Department of Energy, EIA; Alaska Energy Authority, PCE program data; authors' estimates

GROWTH IN POPULATION AND SALES OF ELECTRICITY

From 1970 to 2011, Alaska's population grew 140%, jumping from about 300,000 to 723,000. But total sales of electricity grew much faster—with residential sales of electricity up 350% and commercial and industrial sales up 600%. So sales of electricity grew partly because there were more people using electricity. But what else might have contributed to the increase?

• **The 1970s saw major social and economic changes, and those changes helped drive up both residential and other use of electricity.** Construction of the trans-Alaska oil pipeline led to an economic boom in the mid-1970s. Alaska's population grew one third in just 10 years, and the number and variety of local businesses in urban areas increased dramatically.

Another factor likely increasing use of electricity in the 1970s was affordable natural gas from Cook Inlet, which became available at the end of the 1960s for the Anchorage area. That gas in turn made electricity more affordable for households and businesses. And also in the 1970s, dozens of villages that had previously been without central electricity got generating systems powered with fuel oil, sharply adding to sales of electricity in remote areas.

• **By the 1980s, the total amount of residential electricity being generated continued to grow along with population, but use per person flattened** (as we saw on the front page). That was likely due to a combination of factors, including a sharp increase in the price of oil in the early 1980s; a growing move nationwide toward conserving energy; and increasing energy-efficiency in appliances and lighting.

SOURCES OF ELECTRICITY OVER TIME

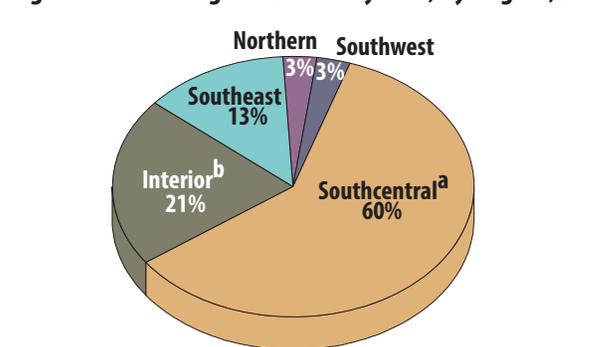
From 1975 to 2011, the amount of electricity generated in Alaska nearly tripled, up from about 2,300 gigawatt-hours to more than 6,500 gigawatt-hours. As Figure 5 shows:

• **Natural gas from Cook Inlet has generated close to 60% of electricity in the state since the mid-1970s**—but that 60% requires three times more gas now than in 1975. As the population of Southcentral Alaska grew and thousands of new businesses opened, the production of Cook Inlet gas ramped up to meet the demand.

• **The share of electricity generated by fuel oil increased from 12% to 16%**, as more villages got generating systems that use fuel oil and as the rural population grew.

• **Hydropower was already an important source of electricity in the 1970s** and it became even more so over time,

Figure 6. Percentage of Electricity Sold, by Region, 2011



^aIncludes the Anchorage, Mat-Su, and Gulf Coast regions.

^bThe Fairbanks North Star Borough and other communities in this region served by Golden Valley Electric Association account for 20.6% of the 21% of statewide sales attributed to this region, with outlying areas of the region accounting for 0.4%.

Sources: U.S. Department of Energy, EIA; Alaska Energy Authority, PCE program data; authors' estimates

with construction of a number of large and small hydro facilities. The share of electricity generated by hydropower increased from 16% in 1975 to 20% in 2011.

• **Coal has been a shrinking source of electricity**, down from generating 14% to 6%. It is used only in the Fairbanks area, where there is a local supply.

• **Wind power is a new source of electricity since the late 1990s, and it still generates less than half a percent** of the state's electricity—but the number of wind-power systems has been growing fast since 2008, when the state started offering grants under the Renewable Energy Fund (Figure 10).

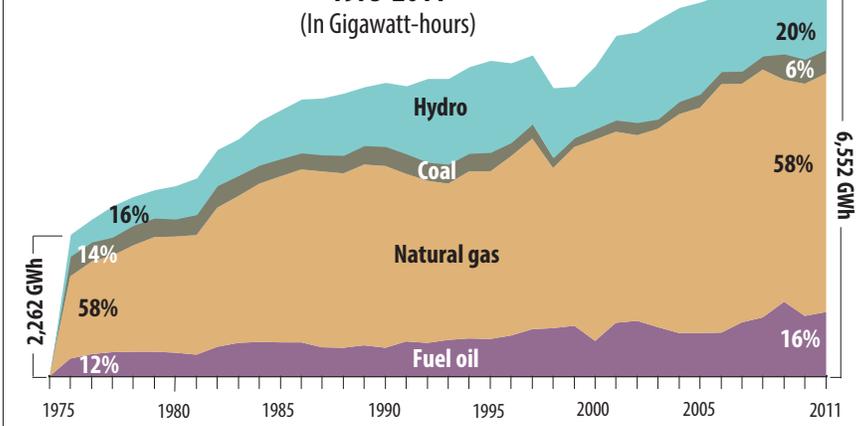
ELECTRICITY SALES BY REGION, 2011

• **The remote Northern and Southwest regions account for only 6% of electricity sold in Alaska** (Figure 6). Nearly 10% of Alaskans live in those regions, but limited commercial development and the high price of electricity contribute to lower use.

• **The Southcentral region, where around two-thirds of all Alaskans live, uses 60% of total electricity**, and the Interior region uses another 21%—but almost entirely in the Fairbanks area.

• **The Southeast region uses 13% of electricity statewide.** Hydropower makes electricity more affordable for a number of communities, but an estimated 5% of those in the Southeast region rely exclusively on fuel oil for generating electricity.

Figure 5. Electricity Generated in Alaska, by Type of Energy, 1975-2011



Sources: U.S. Department of Energy, EIA; Alaska Energy Authority, Power Cost Equalization program data; authors' estimates

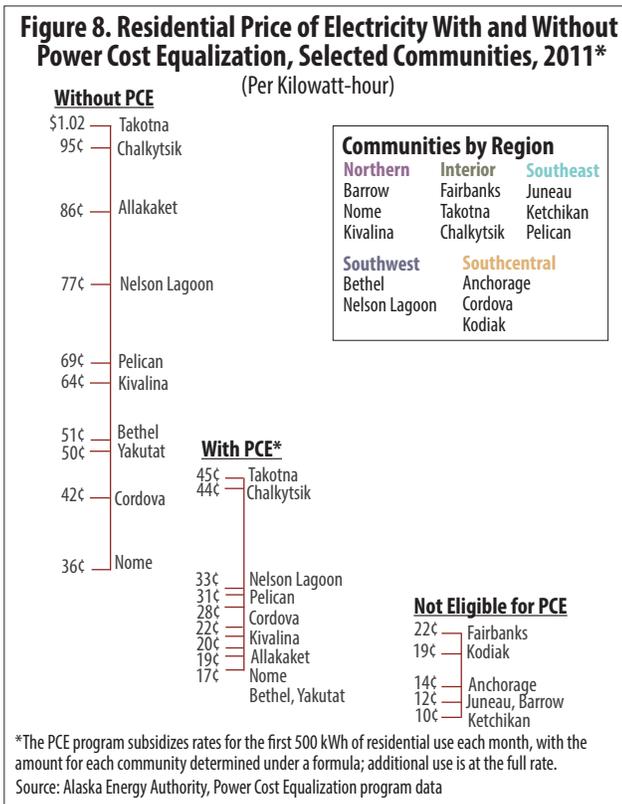
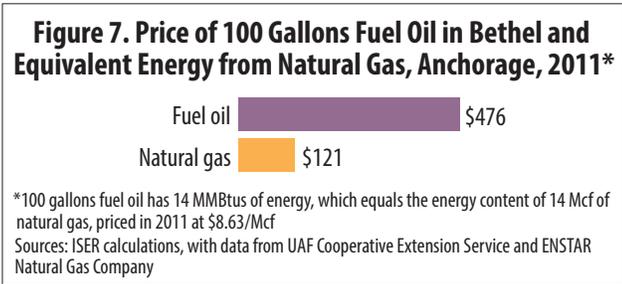
RESIDENTIAL PRICE OF ELECTRICITY

The sharp regional differences in per capita residential use of electricity (as we saw in Figure 2) can be traced in large part to price. That price in small, remote communities that rely largely on fuel oil can be several times higher than in communities with natural gas or hydropower. As an example, Figure 7 shows that the 2011 price of an energy-equivalent amount of fuel in Bethel and Anchorage was four times higher in Bethel.

Figure 8 shows the residential price of electricity in selected communities around the state in 2011, with and without payments from the state's Power Cost Equalization (PCE) program. That program helps reduce the price of the first 500 kilowatt-hours of residential use in many rural communities that generate their electricity mostly with fuel oil.

The state established the PCE program in the 1980s. Price differences among PCE communities can be quite large, depending on community size, remoteness, and other factors. As Figure 8 shows:

- **Without the PCE program, the price of electricity in remote places can be as much as \$1 per kilowatt-hour**, compared with 10 cents to 22 cents in places that have hydropower or natural gas.
- **Even with PCE assistance, the price of electricity in the most remote places can still be more than double that in larger communities**—and any use beyond 500 kilowatt-hours per month is at full rates.



• **Large communities in Southeast and around Anchorage have the lowest rates**, with Southeast benefitting from hydropower and Anchorage from natural gas. (Barrow and Nuiqsut, on the North Slope, also have access to gas from local fields, making them unique among remote communities; they do not qualify for PCE assistance).

• **The price of electricity in Fairbanks is higher than in Anchorage**, and is similar to effective rates in some PCE communities. About two-thirds of electricity in the Fairbanks area is generated with fuel oil and coal.

GROWTH OF RENEWABLE ENERGY

• **Alaska gets a bigger share of its electricity from renewable sources than the U.S. average—21%, compared with around 14%**. Almost all the electricity from renewables in Alaska comes from hydropower; in the U.S. as a whole about half is from sources other than hydropower.

• **Use of wind is growing fast in Alaska**. Installed capacity for generating electricity with wind spiked from 2,355 kilowatts in 2007 to nearly 65,000 kilowatts in 2013, thanks largely to grants from the state Renewable Energy Fund (Figure 9). REF grants have also funded about two dozen other projects that use other renewable energy sources to produce thermal energy.

• **Renewable energy—overwhelmingly hydropower—saved an estimated 98 million gallons of fuel oil** that would otherwise have been used for electricity in Alaska in 2011 (Figure 10). Most places that get at least some of their electricity from renewable energy would otherwise have to rely on fuel oil.

To put those savings in context, if all the energy produced by renewable energy in 2011 had instead been produced by burning fuel oil, about 1.5 times more fuel oil would have been used in Alaska in 2011.

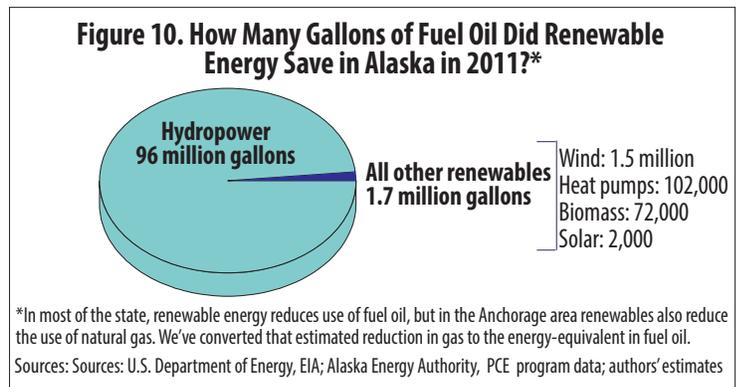
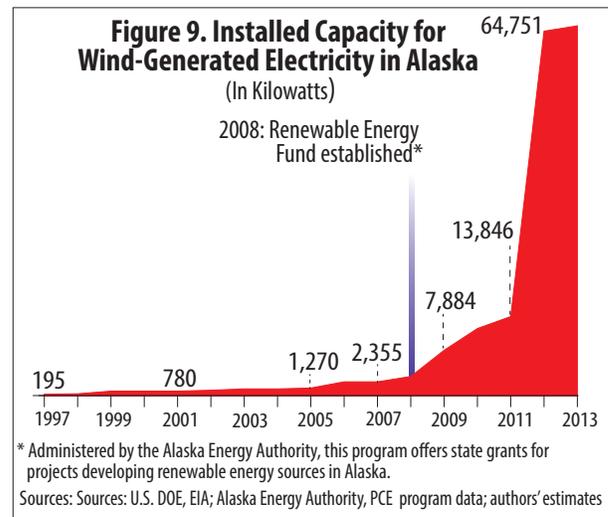
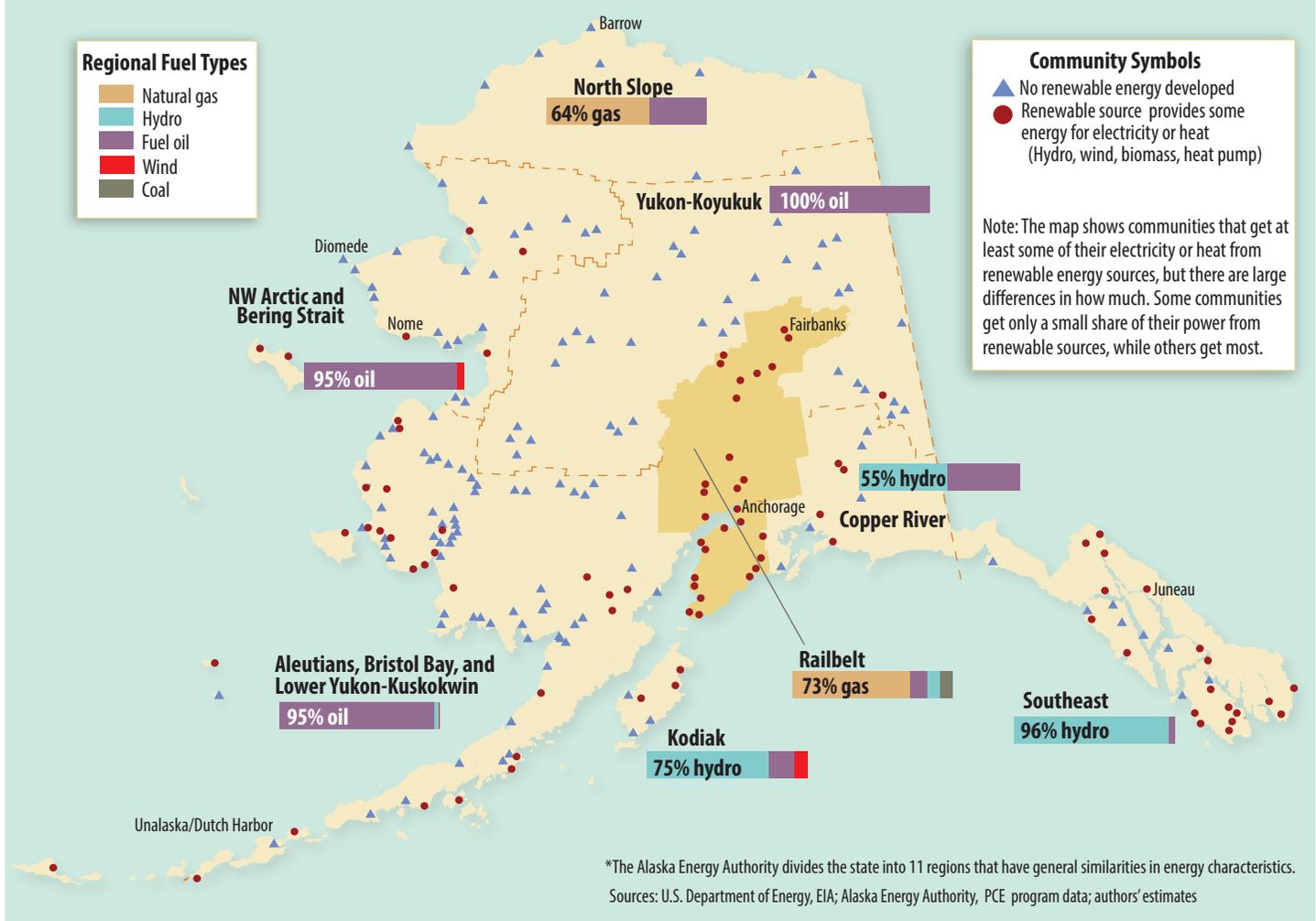


Figure 11. Communities Using Renewable Sources of Energy and Fuels Used to Generate Electricity, by AEA Region,* 2011



HOW WIDESPREAD IS RENEWABLE ENERGY USE IN ALASKA?

The map above shows both community-level and regionwide information about the use of renewable energy in Alaska. The bars summarize types of fuel used in each region as a whole. Red dots show communities that get at least some of their energy from renewable sources. Blue triangles show communities that rely entirely on fossil fuel—namely, fuel oil. The only exceptions are Barrow and Nuiqsut on the North Slope, which have local natural gas fields.

- **Southeast Alaska generates almost all its electricity with hydropower, and Kodiak generates three-quarters.** Kodiak also has a substantial wind-farm. But notice that some smaller communities in both regions still depend on fuel oil.

- **The Railbelt relies mostly on natural gas,** but also uses hydropower, as well as coal and fuel oil around Fairbanks. The map shows fuel status in 2011, but by 2013 Anchorage and Fairbanks also had some electricity generated by wind.

- **Most communities in Western, Northern, and Interior Alaska have no developed** renewable energy sources.

- **A growing number of small communities in Western Alaska do have wind-diesel systems**—in most of those places, wind produces less than 25% of total electricity. A few communities in that region also have small hydro facilities.

OVERVIEW OF CHANGE

Before the 1970s, hundreds of small villages in Alaska had no central electric systems, and most larger communities—including Anchorage—relied on fuel oil to produce electricity. There were some relatively small hydro plants, mostly in Southeast Alaska. Coal still generated more than 15% of the state's electricity. Use of wind power was unheard of until the 1990s.

The discovery of natural gas in Cook Inlet in the 1960s quickly made gas the main source of electricity (and space heating) for Anchorage and nearby areas—and it has remained so for more than 40 years.

In the 1980s the state built several major hydro facilities. That increase in hydro capacity means that today hydropower is the major source of electricity in parts of the state.

Most remote communities still rely on newer versions of the generating systems that first brought electricity to rural places, using fuel oil. But the use of wind and other new technologies hold the promise of less volatile and more affordable electricity for those communities in the future.

The authors are solely responsible for the content of this summary. More energy information is in *Alaska Energy Statistics 1960-2011, Final Report*, December 2013, by Ginny Fay, Alexandra Villalobos Meléndez, and Corinna West, funded by the Alaska Energy Authority. The report and a workbook are available at:

www.iser.uaa.alaska.edu

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