This publication is mostly about electricity in Alaska: how it’s generated, how much fuel is used to produce it, how fuel sources have shifted over time, and how prices vary. An inside foldout map shows how individual communities throughout the state generate electricity.

But besides looking in detail at electricity, it also reports more broadly on energy in Alaska. It includes our estimates of all the types of energy produced and consumed in Alaska, and summarizes changes over time in the prices and amounts of energy Alaskans use.

The information is from analyses we prepared for the Alaska Energy Authority (see back page). We’ve used the best and most recent data, but there’s a two-year time lag before some types of data are available, and in other cases we made estimates, based on limited information.

About 57% of the electricity Alaskans use is generated by natural gas, another 22% by hydropower, 15% by diesel, and 6% by coal. Wind still produces a very small part of electricity statewide, but use of wind power is growing rapidly. Figure 1 previews the more detailed foldout map, showing how some communities around Alaska generate electricity. Many places use more than one power source.

Here we first highlight some findings and then provide more detail inside.

- Utilities around Alaska used about 1.7 million barrels of diesel, 40 billion cubic feet of natural gas, and 410 thousand tons of coal to produce electricity in 2010 (Figure 1). But converting energy sources to electricity is a very inefficient process. In 2008, Alaska’s electrical sector consumed about three times as much energy as it produced in electricity (Figure 4).

- Six times as much electricity was produced in Alaska in 2010 as in 1970, with an increasing share from natural gas and hydropower and a declining share from coal. Wind power was also introduced (Figure 2).

- Use of electricity from hydropower increased more than 10% per capita in Alaska since 1975, even as the population more than tripled. A number of large and small hydroelectric projects were constructed over the past several decades, largely subsidized by federal and state money.

- More than two dozen utilities will be using wind to generate part of their electricity by the end of 2012, up from 7 in 2008. A number of other communities plan to add wind systems. Most of the existing wind power is on Kodiak Island and in small communities in western Alaska (inside map).

- Alaska produces about five times more energy than it consumes, because of North Slope oil. The biggest use of energy in Alaska is for transportation and the smallest is for residential purposes (Figure 4).

**Figure 1. How is Electricity Generated Around Alaska?**
(Net Generation 2010: 6.5 Million MWh)

**Percentages of Statewide Generation, 2010**
- Wind: Less than 0.5%
- Diesel: 15%
- Coal: 9%
- Natural gas: 57%
- Hydropower: 22%

**Fuel Used Statewide, 2010**
- Diesel: 1.664 Million Barrels
- Natural Gas: 40 Billion Cubic Feet
- Coal: 410 Thousand Short Tons

**Snapshot of Selected Communities**
- Barrow
- Fairbanks
- Juneau
- Kotzebue
- Kaktovik
- Anchorage
- Sitka
- Juneau
- Unalaska
- Akutan
- Homer
- Anchorage
- Sleetmute
- Ilamna
- Glennallen
- Nome
- Fort Yukon
- Nome
- Kowukan
- Nome
- Nome
- Nome
- Nome
- Nome

**Key to Symbols**
- Natural Gas
- Diesel
- Hydropower
- Coal
- Wind

Sources: Alaska Energy Authority; U.S. Energy Information Administration; authors’ calculations
Sources and Prices of Electricity

Natural gas discovered in Cook Inlet in the 1950s has been used to generate increasingly more electricity in Southcentral Alaska over the past several decades, as the region's population grew.

The electrical intertie linking utilities from the Kenai Peninsula to Fairbanks—the Railbelt—now gives most Railbelt communities some access to electricity from natural gas. But constraints on natural gas supplies, generation, and intertie capacity limit the amount of lower-priced electricity moved from Southcentral to Interior Alaska.

The Railbelt region also has some hydropower, and the largest communities in Southeast Alaska rely largely on hydropower. Some smaller communities in that region also benefit from hydropower, but others still have to rely entirely on diesel.

Diesel is used to generate electricity in most remote communities, although a growing number are supplementing diesel with wind and other renewable energy sources. Barrow and Nuiqsut on the North Slope have access to natural gas from local fields. Some of the electricity for Fairbanks and surrounding areas is generated with diesel and naphtha, as well as coal.

Figure 3 shows how sources of electricity affect prices and use.

- **Communities that get electricity mostly from hydropower have the lowest prices**—because government subsidized costs of building hydropower facilities—and the highest use. Petersburg and Metlakatla are examples.

- **Places that have access to natural gas, as well as some hydropower, have mid-range use and prices.** That includes Anchorage and Fairbanks.

- **Places that rely mostly on diesel have the highest prices and the lowest use.** That includes communities throughout Western, Interior, and Northern Alaska, as well as those in Southeast without hydropower. These places are generally eligible for payments under the Power Cost Equalization program, a state program that reduces prices of electricity for residential customers (see note on Figure 3).

### Figure 3. Average Annual Residential Use of Electricity and Price per 500 kWh, Selected Alaska Communities, 2010*

<table>
<thead>
<tr>
<th>Community</th>
<th>Average Annual Use, Total kWh</th>
<th>Price per 500 kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petersburg</td>
<td>13,819</td>
<td>$50</td>
</tr>
<tr>
<td>Metlakatla</td>
<td>11,808</td>
<td>$45</td>
</tr>
<tr>
<td>Fairbanks</td>
<td>8,121</td>
<td>$50</td>
</tr>
<tr>
<td>Alaska</td>
<td>7,670</td>
<td>$100</td>
</tr>
<tr>
<td>Barrow</td>
<td>7,649</td>
<td>$75</td>
</tr>
<tr>
<td>Anchorage</td>
<td>7,341</td>
<td>$60</td>
</tr>
<tr>
<td>Cordova</td>
<td>6,415</td>
<td>$65</td>
</tr>
<tr>
<td>Kivalina</td>
<td>5,841</td>
<td>$175</td>
</tr>
<tr>
<td>Toksook Bay</td>
<td>5,389</td>
<td>$120</td>
</tr>
<tr>
<td>Hoonah</td>
<td>4,945</td>
<td>$280</td>
</tr>
<tr>
<td>Diomede</td>
<td>3,059</td>
<td>$180</td>
</tr>
<tr>
<td>Metlakatla</td>
<td>2,927</td>
<td>$255</td>
</tr>
<tr>
<td>Toksook Bay</td>
<td>2,843</td>
<td>$105</td>
</tr>
<tr>
<td>Hoonah</td>
<td>2,843</td>
<td>$276</td>
</tr>
<tr>
<td>Allakaket</td>
<td>2,843</td>
<td>$173</td>
</tr>
<tr>
<td>Healy Lake</td>
<td>1,846</td>
<td>$300</td>
</tr>
<tr>
<td>White Mountain</td>
<td>1,846</td>
<td>$70</td>
</tr>
<tr>
<td>Lime Village</td>
<td>1,075</td>
<td>$365</td>
</tr>
</tbody>
</table>

*In the 1980s, Alaska’s state government funded some large hydroelectric projects, and many residents of Southeast and Southcentral Alaska have lower electric rates as a result. At the same time, the state established the Power Cost Equalization program, which helps reduce the price of electricity by paying eligible utilities part of the price of electricity for residential customers and community facilities. Communities eligible for PCE assistance are determined by state statute, based on local prices of electricity.

Sources: Alaska Energy Authority; U.S. Energy Information Administration; authors’ calculations.
Until now we’ve discussed generation and use of electricity. But Figure 4 looks at Alaska’s total energy picture: it shows our estimates of all the energy produced and consumed in Alaska, as of 2008. We don’t have complete data for more recent years. The figures are in trillion British Thermal Units (Btus), a standard measure of energy content that allows comparison across energy types. Figure 5 shows the equivalent of a trillion Btus, in barrels of oil and other common units.

- North Slope oil accounts for more than three-quarters of Alaska’s energy production. Most of that oil is exported, but some is refined into gasoline and other petroleum products used in Alaska.
- Natural gas from Cook Inlet is used locally, mainly for residential and commercial uses, while most gas extracted on the North Slope is reinjected to boost oil production. The oil producers use some for their North Slope operations, and two North Slope communities have access to natural gas.
- About 40% of the small amount of coal produced in Alaska is exported, and the rest is used mainly for producing electricity in the Fairbanks area.
- Fuel for transportation makes up nearly half the energy consumed in Alaska, and jet fuel alone accounts for a third of total consumption. But almost all that fuel is for flights into and out of the state’s international airports—so it isn’t “consumed” in Alaska the way other fuel is.
- The largest source of renewable energy in Alaska today is hydropower, which generates nearly a quarter of all electricity statewide.

**Figure 4. Energy Produced and Consumed in Alaska, 2008 (In Trillion Btus)**

- Energy Produced: 1,985 TBtu
- Imports: 47 TBtu
- Exports: 1,342 TBtu
- Crude oil: 1,526 TBtu
- Natural gas: 422 TBtu
- Coal: 31 TBtu
- Renewables: 6 TBtu

**What About Electricity?**

Electricity is a form of energy, but it is not an energy source. We convert energy sources (oil, natural gas, and coal) into electricity, which in turn supplies energy for many uses. But the conversion process is very inefficient. In 2008, Alaska’s electric sector consumed three times more energy than it produced in electricity.

**Energy Consumed: 444 TBtu**

- Transportation: 215 TBtu
- Commercial: 47 TBtu
- Industrial: 56 TBtu
- Residential: 40 TBtu

**Sources:** Alaska Energy Authority; U.S. Energy Information Administration; U.S. Army Corps of Engineers, Waterborne Commerce; Alaska Department of Natural Resources; authors’ calculations
**Changing Prices and Use of Energy**

We now look at how the amounts of energy Alaskans use, and the prices they pay for that energy, have changed over time.

- **Electricity is the only form of energy less expensive in 2008 than in 1970**, when adjusted for inflation (Figure 6). The drop of nearly 15% is most likely due to the fact that the state and federal governments subsidized construction costs for a number of hydroelectric projects, so prices do not reflect the full costs of producing the hydropower.

- **All other forms of energy were all considerably more expensive in 2008, but the biggest increases were for jet fuel and diesel fuel.** Real—again, adjusted for inflation—prices for those fuels more than tripled.

- **Real prices of gasoline and natural gas rose in the range of 60% to 80% between 1970 and 2008.**

Alaska’s population tripled between 1960 and 2008. That fast population growth meant that Alaskans on the whole used a lot more energy in 2008. But to get a picture of how energy use changed independent of population growth, Figure 7 shows changing use per capita.

The largest change in energy use happened when discoveries of natural gas in Cook Inlet made relatively inexpensive gas available in Anchorage and adjacent areas. And despite sharp increases in prices, per capita use of gasoline and diesel also increased considerably.

By contrast, per capita use of electricity actually dropped somewhat. That’s probably because appliances and light bulbs and other things that run on electricity became more efficient, and the price of diesel—which is used to produce electricity in some communities—increased considerably.

**Figure 6. Change in Alaska Energy Prices, 1970-2008**

<table>
<thead>
<tr>
<th>Source of Energy</th>
<th>1970</th>
<th>2008</th>
<th>Real Percentage Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity (per kWh)</td>
<td>$0.03</td>
<td>$0.17</td>
<td>-14%</td>
</tr>
<tr>
<td>Natural gas (per Mcf)</td>
<td>$0.69</td>
<td>$3.82</td>
<td>80%</td>
</tr>
<tr>
<td>Distillate fuel (per gallon)</td>
<td>$0.16</td>
<td>$0.89</td>
<td>341%</td>
</tr>
<tr>
<td>Jet fuel (per gallon)</td>
<td>$0.10</td>
<td>$0.55</td>
<td>455%</td>
</tr>
<tr>
<td>Motor gasoline (per gallon)</td>
<td>$0.40</td>
<td>$2.21</td>
<td>65%</td>
</tr>
</tbody>
</table>

Sources: U.S. Energy Information Administration; authors’ calculations

**Figure 7. Changing Per Capita Use of Energy Among Alaskans**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural gas (in thousand cubic feet)</td>
<td>9</td>
<td>491</td>
</tr>
<tr>
<td>Diesel (in gallons)</td>
<td>914</td>
<td>1,719</td>
</tr>
<tr>
<td>Gasoline (in gallons)</td>
<td>308</td>
<td>410</td>
</tr>
<tr>
<td>Coal (in short tons)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Electricity from hydro (in kilowatt-hours)</td>
<td>5,889</td>
<td>9,555</td>
</tr>
</tbody>
</table>

Sources: U.S. Energy Information Administration; Alaska Department of Labor and Workforce Development; authors’ calculations
How Electricity is Generated in Alaska, by Community, 2012*

Communities in Blue: Eligible for Power Cost Equalization Program
Communities in Green: Not eligible for Power Cost Equalization Program

*The map includes renewable energy projects that are complete as of mid-2012 and those scheduled to be completed by the end of 2012.

The Railbelt Intertie

Alaskas Railbelt region runs roughly 350 miles from the tip of the Kenai Peninsula north to Fairbanks. Nearly 77% of all Alaskans live in this region—which is called that because it includes areas along and near the route of the Alaska Railroad. An intertied grid connects the six utilities that provide electricity in the Railbelt. All six utilities use natural gas from Cook Inlet to generate more than 90% of their electricity. All Railbelt utilities share hydropower from the state-owned Bradley Lake Dam on the Kenai Peninsula, and some also have additional sources of hydropower. Wind power from Fish Island near Anchorage is scheduled to be available by late 2012.

- Chugach Electric Association is the largest utility, directly providing electricity to most of Anchorage and some other communities in Southcentral Alaska. It indirectly provides the majority of electricity for the Railbelt, because it sells gas-generated power to other railbelt utilities. It also owns the Cooper Lake hydroelectric facility on the Kenai Peninsula and is a partner owner of the Eklutna Lake hydroelectric facility north of Anchorage.

- Anchorage Municipal Light & Power serves part of Anchorage. The utility has its own natural gas supply and is also part owner of the Eklutna Lake hydroelectric project. It sometimes sells electricity to other railbelt utilities.

- Matanuska Electric Association provides electricity from northeast Anchorage through the Matanuska-Susitna Borough. It buys power from Chugach Electric and is also a part owner of the Eklutna Lake hydroelectric plant.

- Golden Valley Electric Association serves Fairbanks and other Interior communities as far south as Cantwell. GVEA is the only utility that generates a large share of its power from fuel oil, sulphur, and coal. It also has some wind power and a small solar project. It buys some electricity from Chugach Electric.

- Homer Electric Association serves most communities on the west side of the Kenai Peninsula. It buys most of its electricity from Chugach Electric and operates the Bradley Lake hydroelectric facility for the Alaska Living Authority.

- Seward Electric System is the smallest Railbelt utility, providing electricity to Seward, on the east side of the Kenai Peninsula. It buys most of its power from Chugach Electric.

Hydropower in Southeast Alaska: Not All Communities Have It

- These communities (in blue) have hydropower and the state’s lowest electric rates.
- These communities rely entirely on diesel to generate electricity and have among the highest electric rates in the state.
- These communities generate electricity with a combination of hydropower and diesel and have lower electric rates, but still high enough to qualify them for PCE payments.
- These communities generate electricity without a centralized hydroelectric facility; they generate water, depending on water levels.

Notes:
- A number of unincorporated communities, especially those in larger urban areas, are not shown. Also not shown are the two entire Aleutian Islands, only one hydroelectric facility is on these islands. And because the number of buildings and rural populations is very small, they are not depicted with symbols. As of mid-2012, Golden Valley Electric Association has a small solar project in operation, and Matanuska Valley Electric Cooperative has a solar project under construction in Talkeetna. In Fall, the school district is converting to biomass heating systems to provide both electricity and heat.
- There is no centralized electric utility in western Alaska. Each major community has a hydroelectric facility built on a river. In a small rural community, a hydropower project may provide the majority of electricity sold by the facility to the facility.
- Matanuska Electric Association (MVEA) provides electricity to more than 50 small communities in its service area.
- The state of Alaska has a number of small sources of hydropower in southeastern Alaska, primarily in the area around Fairbanks, as well as on the Kuskokwim River.
- Most of the communities around Alaska operate their own local electric utilities.