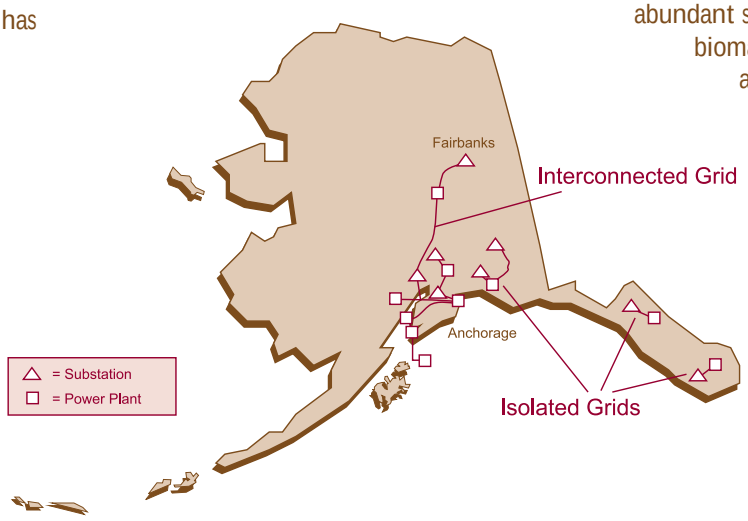
Alaska and Hawaii

Isolated Grid Systems

Far out on Alaska's Aleutian chain is Shemya Island, a lonely stretch of rock in the northern Pacific closer to Japan and Russia than to the mainland United States, or even to mainland Alaska. The winds blow so severely and constantly here that pedestrians walk hunched against the wind. Yet the island's lone community, Earekson Air Force Station, does not tap the wind resource for its electricity. Instead, it relies on diesel fuel transported over thousands of miles of ocean.

Alaska, in a sense, is made up of islands: islands of communities isolated by stretches of land or sea and islands of small electric generating plants isolated from grid networks. Alaska has a single interconnected grid system that serves only Anchorage, Fairbanks, and the Kenai Peninsula. Much of the rest of the state relies on small diesel generators, with many communities dependent on state subsidies to provide them with affordable electricity.



Alaska has only one interconnected grid system which covers only a small portion of the state. Much of the rest of the state depends on small diesel generators.

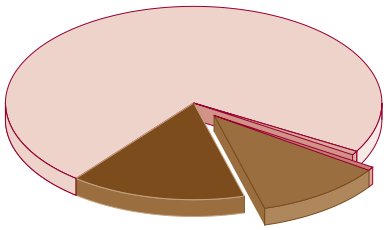
Like Alaska, Hawaii also has small and isolated electricity grids. Each island provides electricity for its own residents. As a result, utilities are unable to take advantage of shared generating reserves available in large power systems. Hawaii must depend on small power plants, which cost more per unit of generated energy than large plants. Hawaii's problems are exacerbated by the fact that it has no reserves of fossil fuels. Yet it depends on oil and coal, imported at premium prices, to generate about 85 percent of its electricity.

Sustainable Local Resources

There's not much that Alaska and Hawaii can do to interconnect their isolated grids, but there is plenty they can do to reduce their dependence on imported resources. Both states have large reserves of local renewable resources that can be harnessed to provide almost any community with the electricity it requires. Hawaii, for example, has abundant solar, geothermal, wind, and biomass resources. The state already uses this abundance to provide more than 300 megawatts of capacity. Alaska and Hawaii also have high electricity rates, which provide an incentive to tap into renewable resources.

Annual Electricity Production (million kilowatt-hours)

1,500	Coal
7,500	Oil
70	Gas
60	Hydropower
1,100	Renewables



In 1995, the primary energy source for electricity production in Hawaii was oil. Although Hawaii has abundant renewable resources, renewables provide only 12 percent of its electricity.

Hawaii

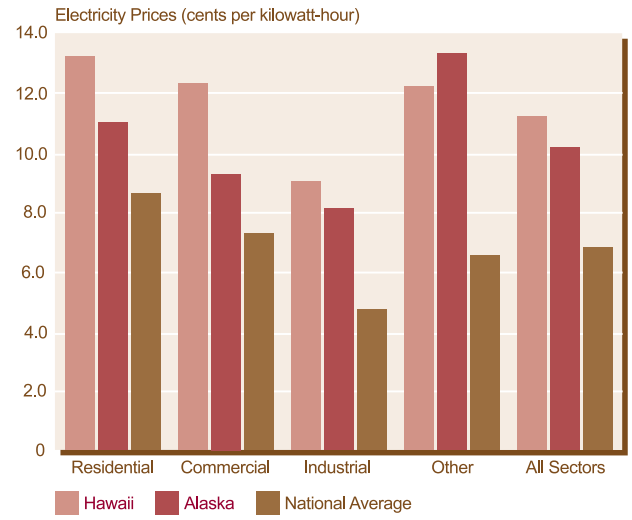
Most of Hawaii's renewable energy comes from bagasse (the remains of sugar-cane once the juice has been extracted). The state also has small amounts of wind, hydroelectric, and geothermal capacity. In addition, Hawaii takes advantage of its solar energy to offset electric energy with more than 60,000 solar water heating systems. The state recently published a report concluding that renewable energy could provide nearly 3,000 megawatts of generating capacity during the next decade. Some of the islands, including Kauai, Hawaii, and Oahu, have solar resources that rival those of southern California. In June 1998, 10,000 square feet, totalling 75 kilowatts of lightweight photovoltaic roofing tiles, were installed on the Mauna Lani Bay Hotel on the big island of Hawaii. It is the largest rooftop photovoltaic system in the state. Hawaii may also represent the best market in the nation for distributed photovoltaic systems. In 1997, the islands of Hawaii, Maui, and Oahu initiated a 2-year pilot program called "Sun Power for Schools," which involved a dozen schools and installation of

2-kilowatt photovoltaic panel systems. Customers are currently paying as much as 20 cents per kilowatt-hour for their electricity, creating a prime opportunity for the installation of more solar hot water systems to offset the need for electricity.

A similar, and possibly larger, opportunity exists for using wind energy. With the exception of Niihau, each island has a large wind resource. Some islands have enough wind energy resources to supply all of their electrical needs. The state could also expand its use of biomass, including landfill gas, or further exploit its relatively small hydroelectric potential.

Alaska

In 1995, the primary energy source for electricity production in Alaska was natural gas. Including hydropower, renewables provide 18 percent of Alaska's electricity. More than 75,000 Alaskans live in the 175 communities that are not grid-interconnected and must supply their own electricity. Even with state subsidies, these communities pay up to twice as much for electricity as do the residents of Anchorage. Alaska can expand its use of indigenous renewable resources in its isolated grid networks. Kotzebue Electric Association has embarked on a program that plans to install 2 to 4 megawatts of wind over the next several years. One strategy would to be to expand the use of hybrid systems. A hybrid system is one that uses a combination of resources and technologies to generate electricity. Such systems could use wind readily (especially along the Aleutian chain, the Gulf of Alaska, and the Coastal Range in southern Alaska) when that resource is available and then switch to a fossil fuel or to wood, wood waste, or hydroelectricity when the wind isn't blowing. Hydroelectric power may also prove to be a good solution, either as a stand-alone or in hybrid configurations.



In 1995, Alaskans paid as much as 21 cents per kilowatt-hour for electricity and average electricity prices are 46 percent higher than the U.S. average. The average electricity prices in Hawaii were 54 percent higher than the national average.

Small-Scale Hydropower — An Inexpensive Alternative

Communities in Alaska and Hawaii find that their electricity is expensive. A less expensive source of power for these areas may be small-scale hydropower plants. It is this fact that led King Cove, Alaska, and Hilo, Hawaii, to turn to locally available hydroelectricity.

Before December 1994, King Cove, Alaska, a remote mountain village 624 miles southwest of Anchorage, paid 21 cents per kilowatt-hour for its electricity. That is because the village had depended on diesel fuel to generate its electricity. The diesel fuel it used was expensive and unreliable because it could only be delivered by air or sea, and only when the weather permitted.

Now, King Cove has a new hydroelectric facility to replace its diesel generator. This facility not only provides King Cove with clean electricity derived from local streams, it promises to drop the cost of the town's electricity by 10 to 15 percent. It does this by using a run-of-the-river design in which water is drawn from two creeks and sent to a powerhouse 250 vertical feet below the water intakes. The falling water turns a turbine, which generates 800 kilowatts of electric power.

Duane Hippe, HDR Alaska

A facility near Hilo on the island of Hawaii also uses a run-of-the-river design. This facility relies on the natural water flow of a nearby river to provide 12 megawatts of power. Unlike the King Cove facility, the Hilo hydroelectric plant does not provide electricity just to nearby Hilo. Rather, the power is sold to the Hawaiian Electric Light Company and distributed throughout the island. The Hilo facility provides the island with about 6 percent of its electricity.