FREQUENTLY ASKED QUESTIONS

What's an Inter-Island Undersea Transmission Cable System?

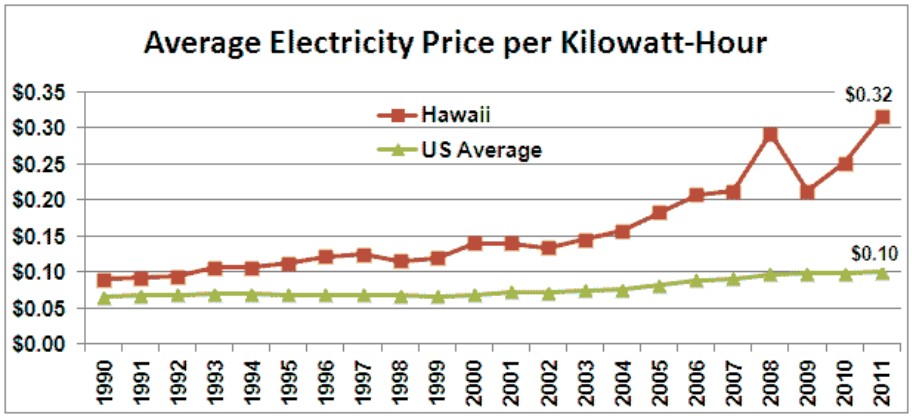
One or more inter-island cables could connect us with power and high speed broadband. This concept is called the "undersea transmission cable" or "interisland cable."

By connecting the islands' transmission systems, an interisland cable will help Hawaii develop more renewable energy projects and help the state reach its target of 70 percent energy independence by 2030.

Is this important?

Yes. Hawaii has the highest energy prices in the nation; Hawaii's electricity prices are about **3 times higher** than the U.S. average!

Energy costs are a major burden for local consumers and businesses and have a huge impact on Hawaii's economy.



The average household pays more than $200 a month for electricity, making it one of the largest expenditures behind housing, food and gasoline.

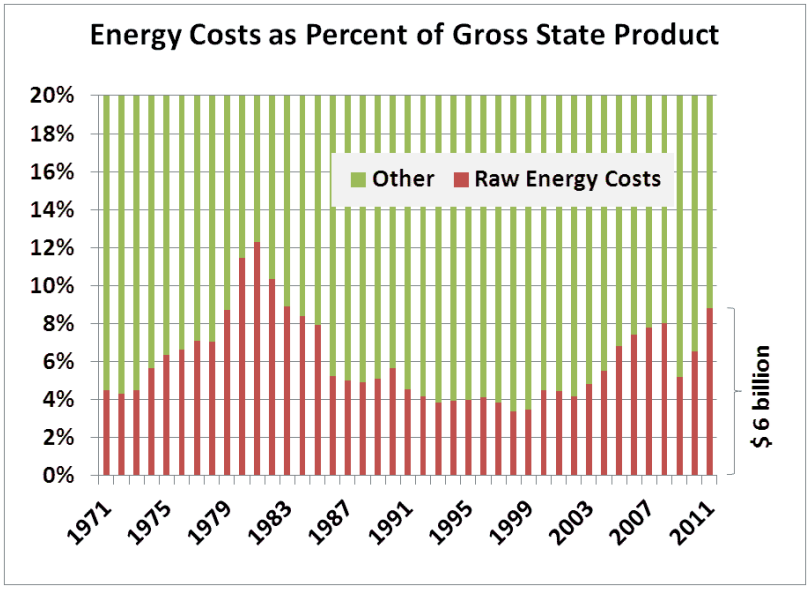
So when oil prices rise, consumers, business and government agencies must use more of their budgets to cover their energy bills, leaving them with less money for other priorities.

If this goes on long enough, many companies will need to reduce staff, cut back on purchases, or go out of business. The cost of living increases and families suffer, and agencies and organizations find it difficult to fulfill their obligations.

There are two primary causes for Hawaii's high electricity prices:

1. Hawaii has a uniquely high dependence on petroleum-based fuels (Hawaii is 77% dependent on oil for electricity; the U.S. average is 1%).
2. Hawaii has six separate electric grids that are relatively small and we do not have neighboring grids to draw power from as do mainland utilities.

A cable system interconnecting islands could help in both of these areas.



With an inter-island transmission cable, would our electricity rates go up or come down?

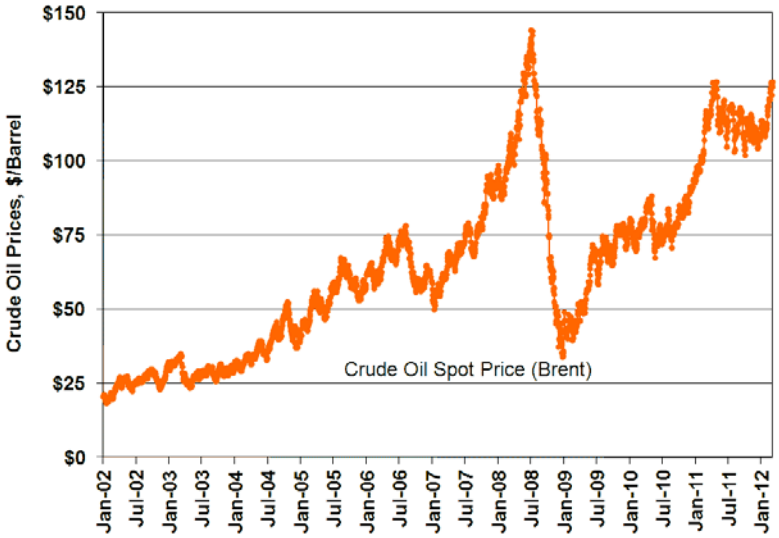
Connecting our islands could help prices rise less abruptly than they are expected to without the cable and would also reduce the uncertainty of rates rising with oil price shocks.

How could electricity prices rise less with the cable?

Since so much of our electricity is generated by burning imported foreign oil, our electricity prices go up when oil prices go up.

Connecting the islands would allow us to use more of our own renewable resources — at fixed, predictable prices NOT tied to the price of foreign oil.

This will reduce the budgetary and economic impacts of sudden increases in oil prices.



What types of renewable energy could an interisland cable deliver?

Geothermal	Solar	Wind
Hydropower	Bioenergy	Ocean Energy

Who would pay for it?

Private developers and investors will pay the up-front costs. All costs, including the current costs of generation, transmission – and fluctuating oil prices – are ultimately paid for by ratepayers.

Who bears the risk?

Private developers and investors will take on all of the risk for planning, permitting and building the cable. It is only after the cable is operating, and the Public Utilities Commission has determined that the cable is "used or useful," that the cable owners will begin to receive payment – and then only for electricity actually delivered.

How is legislation (Senate Bill 2785) helpful right now?

The legislation makes it clear that a private developer can finance, build, and operate the cable. Having this clearly stated in law will lower financing costs for the construction of the cable.

Are undersea power cables used elsewhere?

Yes. High voltage direct current (HVDC) and alternating current cables are used in many parts of the world. They connect islands with one another, connect islands to a nearby mainland, transmit power across channels or rivers, and transmit power to offshore drilling sites or from offshore wind farms.

The largest submarine cable network in operation has a capacity of 2000 MW, or more than Hawaii's entire statewide electricity demand. Some have been in service continuously for more than 30 years. For example, SACOI (Sardinia-Corsica-Italy-France) is a 300 MW, 75-mile undersea cable installed in 1967. There are a variety of HVDC systems in use around the world, including:

- Baltic Cable (Germany - Sweden), 155 miles: 500 megawatts (MW) installed in 1994.
- Basslink (Victoria – Tasmania, Australia), 183 miles: 500 MW installed in 2006.
- BritNed (Britain – Netherlands), 162 miles: 1000 MW installed in 2011.
- Cross Sound Cable (New York - Connecticut), 24 miles: 330 MW installed in 2002.
- Estlink (Estonia - Finland), 65 miles: 350 MW installed in 2006.

- Fenno-Skan 1 (Sweden - Finland), 124 miles: 572 MW installed in 1989; 800 MW in 2011.
- Cross-Channel (UK - France), 28 miles: 2000 MW installed in 1986.
- Gotland (Sweden) (first commercial HVDC submarine cable), 60 miles: 20 MW in 1954; 260 MW in 1987.
- Hokkaido-Honshu (Japan), 27 miles: 150 MW in 1979; 300 MW in 1980; 600 MW in 1993.
- Inter-Island (New Zealand), 26 miles: 700 MW installed in 1965.
- Italy-Greece, 75 miles: 500 MW installed in 2001.
- Jeju Island Cable (Korea), 60 miles: 300 MW installed in 1998.
- Kii Channel (Japan), 31 miles: 1400 MW installed in 2000.
- Kontek (Germany - Denmark), 32 miles: 600 MW installed in 1995.
- Konti-Skan (Sweden - Denmark), 54 miles: 300 MW installed in 1988.
- Leyte - Luzon (Philippines), 13 miles: 440 MW installed in 1997.
- Neptune (US, New York-New Jersey), 50 miles: 660 MW installed in 2007.
- NorNed (Netherlands – Norway) (longest HVDC submarine cable), 360 miles: 700 MW installed in 2008.
- SACOI (Sardinia-Corsica, Italy-France), 75 miles undersea: 300 MW installed in 1967.
- SAPEI (Italy) (deepest HVDC submarine cable, at 5380 feet), 261 miles: 1000 MW installed in 2011.
- Swepol (Poland and Sweden), 152 miles: 600 MW installed in 2000.
- Trans Bay Cable (US, California), 53 miles: 660 MW installed in 2010.

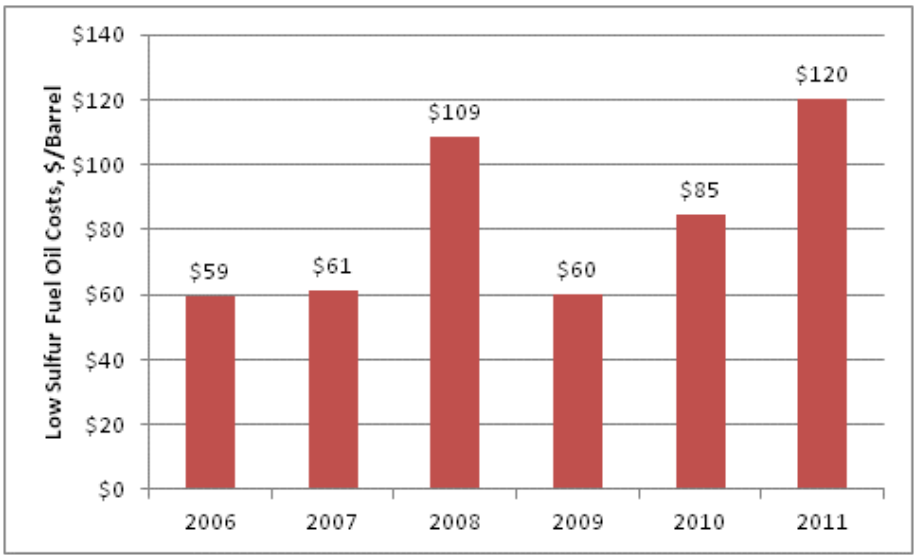
Why have other places installed undersea power cables?

Undersea cables can move lower cost power to an area of high costs, improve energy security and reliability, and can help reduce the potential for power outages. These all apply to Hawaii.

What are Hawaii's actual fuel prices?

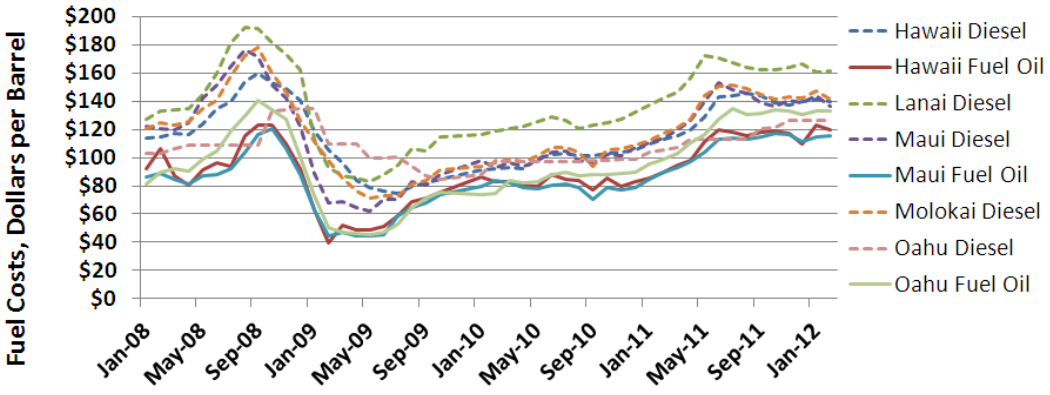
In 2008, the price of low sulfur fuel oil in Hawaii spiked to $140 per barrel, but the average price over the year was "only" $109.

In 2011, the average price ($120) over the year was even higher than in 2008. In January, fuel oil on Oahu was $95 per barrel; it reached $134 in July; by December, it was $131. Diesel prices on some of the other islands were as much as 48% higher, over $140 per barrel.



How much will it cost?

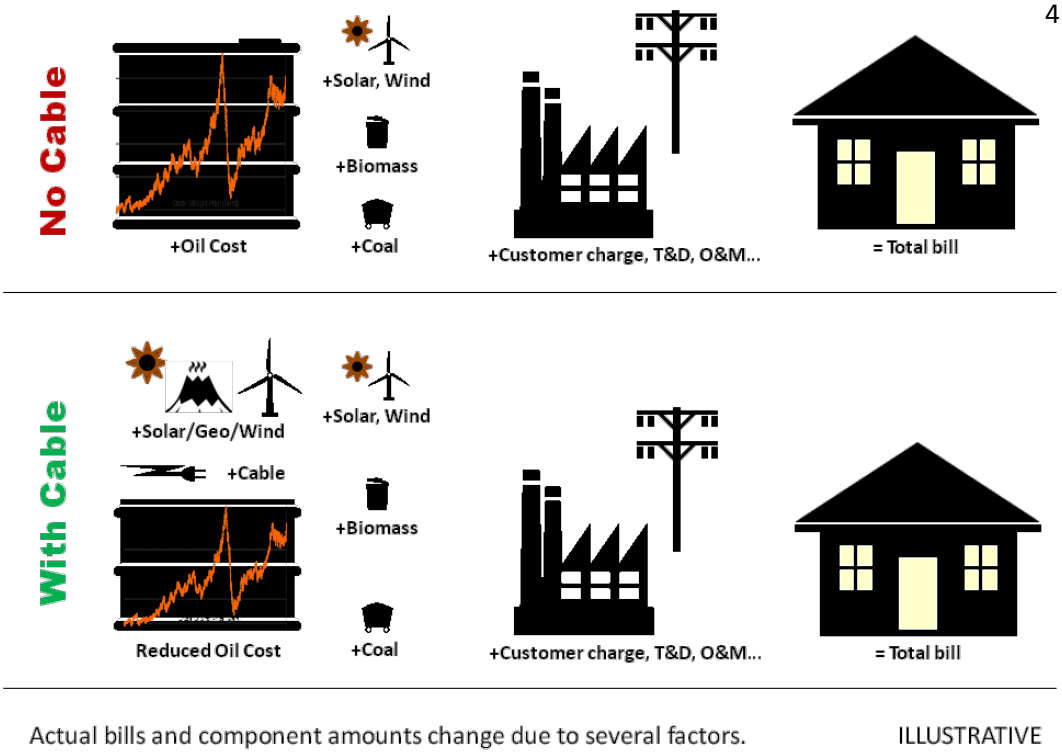
With low sulfur fuel oil at $135/bbl, the cost of **just the oil** burned in oil-fired generators is $0.24 per kWh.



Based on similar cables elsewhere, the projected cost to deliver power via an 80-120 mile cable is less than $0.10 per kilowatt-hour (kWh) at 40% capacity. At a higher capacity it

drops below $0.07 per kWh. A variety of renewable energy projects have been considered by project developers and energy analysts. Several estimates of power generation costs are between $0.08 and $0.18 per kWh.

So, an inter-island transmission cable could be cost-effective now, based on reasonable cost assumptions.



Once the cable has been built and is in service, we will see a portion of the oil cost eliminated and replaced with more predictable costs for renewable energy & cable.

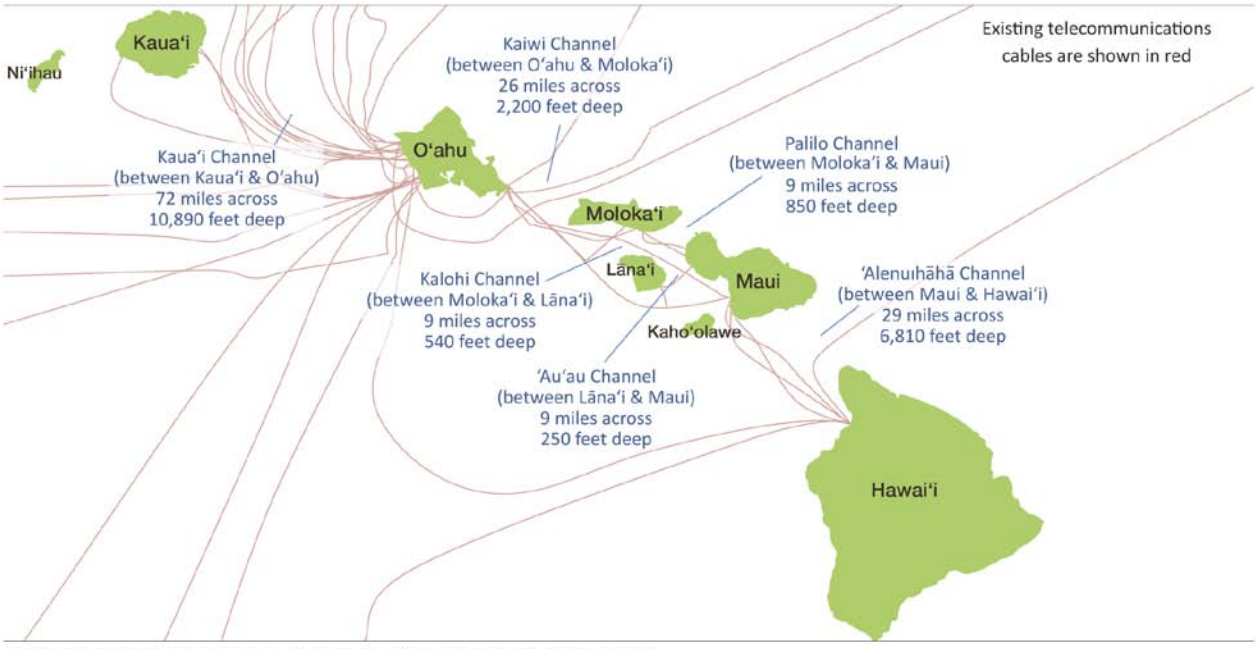
How large is an undersea power cable?

A 400 MW high voltage direct current transmission cable is about four inches in diameter. When combined with a return cable and fiber optic communication cable, the bundle is about 10 inches in diameter.

The bundle shown in the picture is 500 MW.

Does Hawaii already have undersea cables?

Hawaii has many telecom cables to and between the islands; no power cables.



Source: Bureau of Ocean & Energy Management & National Oceanic & Atmospheric Administration

How much electricity can be transmitted through an undersea power cable system?

A 400 MW system, working at 40 percent capacity, could deliver electricity equal to about 14 percent of Hawaii's needs, or the amount used by 194,000 households.

At 60 percent capacity, it could deliver electricity equal to the amount used by 291,000 homes. At 80 percent, it could carry 28 percent of the electricity used in the state, nearly equal to the energy used by all of Hawaii's households.

How long is an undersea HVDC cable expected to last?

40 years.

Where would the cable be laid and where would it come out of the ocean?

The route will be determined during the design, environmental review, and permitting phases with full public input. It is likely the cable will run underground at shorelines, as telecommunication cables do now.

Do undersea power cables harm fish?

No. There are no reported marine life impacts in areas with undersea cables. Many of these areas have thriving fishing industries. It is normal to find marine life attached to and congregating in areas both with and without cables.

Minimizing environmental impacts will be critical during environmental review, design and installation. Based on the experiences elsewhere, the impacts of cable installation are brief and minimal. Laying cable does cause some disturbance of the ocean floor, but within days the area returns to normal.

Will an Environmental Assessment (EA) or Environmental Impact Statement (EIS) be prepared?

Yes, any project –renewable energy facility, cable, or utility system upgrade – is required to complete project-specific environmental reviews in accordance with state and federal laws.

What is a Programmatic Environmental Impact Statement?

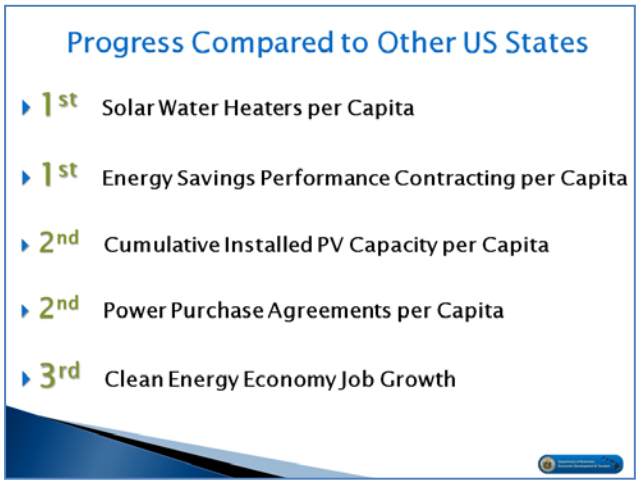
In addition to environmental reviews that will be conducted for each project, an overall Programmatic EIS analyzes the environmental impacts associated with the development and implementation of a broad program with several parts. It describes best management practices and mitigation measures for the program. Project-level environmental reviews may reference and be informed by (i.e. tier off from) a programmatic EIS.

Will there be any direct benefits to communities where renewable energy projects are located?

Often, a renewable energy developer and a community will work together on a "community benefits package" or "community benefit agreement" to fund priorities within that community.

Benefits can be tailored to reflect the specific vision of the area. Those benefits could include community centers, preschools, affordable housing, scholarships, environmental preservation, local hiring, apprenticeships, or commitments to maintain employment at current levels. They also could include reduced electricity rates, fishing and hunting access, funding for local organizations, habitat conservation for endangered species, direct use of energy resources, or other economic development measures.

Couldn't we just use solar energy?



Hawaii is a leader in solar energy. We need as much solar energy as we can add – residential, commercial and utility-scale.

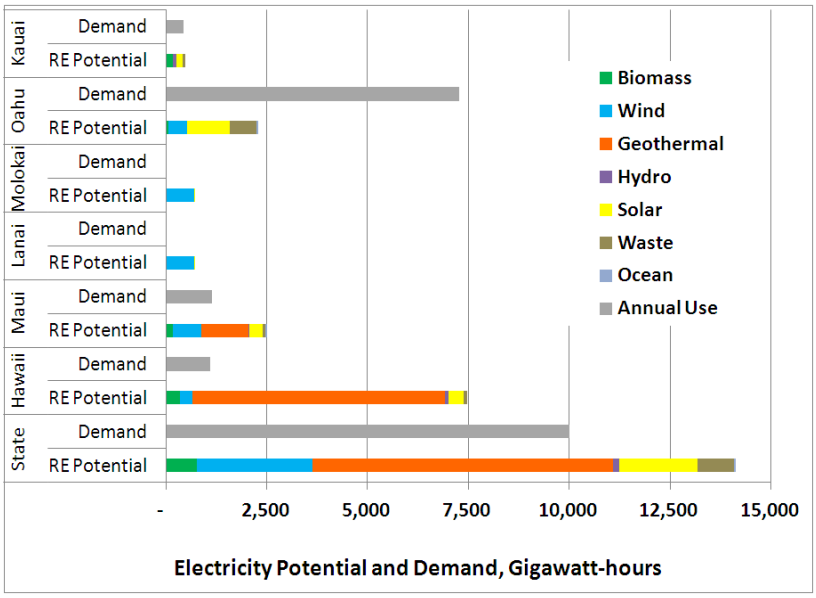
Solar water heating is an important part of the energy efficiency portfolio standard, which requires state-wide energy conservation and energy efficiency savings of 4300 Gigawatt-hours by 2030: greater than the amount of electricity currently used by all the residential utility customers in Hawaii!

Rooftop and utility-scale solar electricity (photovoltaics and concentrating solar power) are included in the renewable portfolio standard, which requires the state to obtain 40 percent of its energy needs from renewable sources by 2030. One thousand megawatts of solar electricity could provide 17 percent of the electricity needed statewide – if grid upgrades, energy storage, and energy transmission systems are in place.

Solar is important. However, it cannot meet Hawaii's goals by itself.

Where are Hawaii's renewable energy resources?

Assessments over the years have looked at Hawaii's site-specific renewable resources and commercially available technologies. The graphic shows the resource potential by island. Not all potential will be developed. Some sites will be preferred, and others will be avoided, for cultural, economic or other reasons.



How much electricity could be produced by Hawaii's renewable energy resources?

Hawaii's renewable electricity potential is immense.

Connecting the islands by cable could allow solar, wind, geothermal, and other energy resources to be more widely available, and would provide greater incentives for renewable energy investment in Hawaii. Today, some renewable energy is not usable when generation exceeds demand on that island.

With a cable system, renewable energy could be transmitted to other islands where the excess energy could be used. Likewise, when local renewable energy production is reduced or interrupted, the local area could use energy from elsewhere. The figure shows existing demand and potential supply, in gigawatt-hours.

Is it fair for the islands to rely on each other?

Our islands are already economically interdependent. Resources such as a deep draft harbor, military bases, the major international airport, oil refineries, fuel storage terminals, most government offices, major medical centers, bank headquarters, and more, located on Oahu, serve the entire state.

This interdependence is efficient and provides lower costs that support and enrich all our island communities. In the area of energy, crude oil is imported to and refined on Oahu, then shipped to neighbor islands; thus, those islands do not need their own crude oil off-loading or refineries. Energy has moved from Oahu throughout the state this way for nearly 100 years.

Replacing imported fuels with in-state energy projects generates jobs, income and tax revenues that support local communities with funds that otherwise would have flowed out of the state.

Relying on each other to share renewable resources and to control our energy costs will strengthen all parts of Hawaii's economy. This benefits all the islands.

What happens if the undersea cable is somehow damaged?

Existing fossil fuel burning units will still be used; they will just not be using as much oil. They will still be available to provide power when needed.

Will the passage of SB 2785 (Act 165 of 2012) mean that there will be wind farms on Lana'i and Moloka'i?

No. The Act describes a regulatory framework for an undersea cable. It doesn't fund, permit, or build anything.

What does Hawaiian Electric Co. stand to gain from an undersea transmission cable?

Hawaiian Electric Co. (HECO) is not a cable developer, and is not in a position to profit from the cable. However, the company is required to reduce its dependence on oil by achieving 40% renewable electricity generation by 2030. If that goal is not met, HECO faces fines – and fewer customers, as Hawaii's economy is negatively affected by high energy costs. The inter-island cable will provide a cost-effective means to distribute clean, renewable energy sources among the islands and play a significant part in helping to achieve the 40% renewable energy goal.

What about broadband?

The cable system has fiber optics to allow communication between the connected islands. Additional communication fibers could be included with the electric cable to support high-speed broadband systems.

Summary

Hawaii's electricity costs are the highest in the U.S., and have been rising. This has caused difficulties for citizens, businesses, agencies, organizations, and Hawaii's economy, and there is concern that it will get worse.

A cable interconnecting the islands could reduce our dependence on petroleum-based fuels for electricity, and help to stabilize our energy costs.

Working together to interconnect our islands is creating an opportunity for success.

For more information, see energy.hawaii.gov.