

PUBLIC ATTITUDES ABOUT RENEWABLE ENERGY IN HAWAI'I

ABSTRACT — *A representative survey of 1,214 Hawai'i residents was conducted for the purpose of assessing public attitudes about different technologies for generating electricity. Renewable energy (RE) technologies were very highly favored: 97% of the public supported increased development of at least some forms of RE in our state. This support for RE was motivated by concerns for environmental protection, sustainability, and energy independence and by frustration with local energy prices. Solar and wind power were the most widely accepted forms of RE (with 92% and 86% favorable opinion, respectively), followed by hydroelectric (76%) and geothermal power (75%). Municipal waste (58%) and biomass combustion (53%) were less widely endorsed but were still acceptable to the majority of residents. Only a small segment of the public endorsed conventional sources of energy generation—nuclear (22%), oil (13%), and coal (12%). There were modest differences in attitudes as a function of age, gender, and education, but no differences across counties.*

BACKGROUND AND PURPOSE — Increasing the proportion of energy provided by renewable sources is a key goal of regional, national, and international energy policies. Multiple pressures on conventional energy systems include increasing levels of energy consumption, the cost of fossil fuels, the specter of peak oil, potential international conflict related to control of energy resources, and the urgent need to reverse global warming and stem environmental degradation.

Energy concerns are particularly striking for the state of Hawai'i, which faces energy-related issues that distinguish it from the rest of the nation. With no internal sources of fossil fuel, our state is dependent on imported petroleum (primarily of foreign origin) for both transportation and electricity generation. In 2011, Hawai'i imported 93% of its total energy needs (U.S. Energy Information Administration, 2014a), and in a striking difference from the rest of the country, over 70% of our electricity is generated by burning petroleum (see Table 1).

This petroleum dependence comes at a high cost. Hawai'i spends 10% of its GDP on energy and consistently has the nation's highest prices for gasoline, electricity, and natural gas (American Automobile Association, 2014; U.S. Energy Information Administration, 2014a). Local electricity rates are especially high, at 3 to 4.5 times the U.S. average.

Hawai'i is well situated to take advantage of RE. It is estimated that our state could generate significant portions of current electricity needs from offshore wind power (22%), rooftop photovoltaic panels (49%), and geothermal power (71%). In fact, the potential capacity combined across multiple RE sources exceeds current levels of electricity use (Farrell & Morris, 2010).

The Hawai'i Clean Energy Initiative (HCEI), established in 2008 as a cooperative agreement between the state and the U.S. Department of Energy, establishes renewable energy goals and policy for the upcoming two decades. By 2030, Hawai'i aims to meet 70% of its total energy needs through clean sources. This will be done by implementing the following:

- Generating 40% of electricity from renewable sources;
- Reducing electricity demand by 30% through conservation, efficiency measures, and energy offsets such as rooftop solar water heating; and
- Decreasing the use of petroleum fuels for ground transportation by 70% and increasing the use of biofuels in aviation (State of Hawai'i Department of Business, Economic Development and Tourism, 2011a).

The percentage of statewide electricity sales generated from RE sources increased to 18% in 2013 from 14% in 2012 (Hawaiian Electric Company, n.d.; U.S. Energy Information Administration, 2014b). Hawai'i is among the nation's leaders in per-capita generation from rooftop solar and geothermal sources; O'ahu also houses the world's largest commercial electric power plant run entirely on renewable biofuel (U.S. Energy Information Administration, 2014a). Despite these welcome advances, much progress still needs to be made in order to reach the HCEI goals (Braccio, Finch, & Frazier, 2012).

The views and interests of the consumer must be taken into account as Hawai'i faces its energy future. When a high degree of communication, engagement, and collaboration is established between policy-makers, key stakeholders, and the general public, the resulting policies should be more accepted, beneficial, and successful (Cass, 2006). Public input on the HCEI was solicited, primarily in the context of open forums and stakeholder panels (e.g., State of Hawai'i Department of Business, Economic Development and Tourism, 2011b; U.S. Department of Energy, 2012). Public opinion surveys are another way by which feedback can be obtained. Statewide surveys have been conducted on selected RE issues—namely, attitudes towards seawater air conditioning and net metering policy (*Honolulu Star-Advertiser*, 2013; Lilly, Konan, Lerner, & Karl, 2012). However, few efforts have been made to collect local data on public attitudes towards the wide variety of potential RE technologies for Hawai'i.

The purpose of this report is to present results from a statewide representative survey of public attitudes towards six different sources of RE and three sources of conventional energy generation. Our specific research goals were to

- measure the level of public support for RE in general as well as for specific RE and conventional energy sources,
- describe the reasons that lead the public to support or oppose RE, and
- determine whether perceptions differ by county or respondent characteristics.

Table 1: Percent of total electricity generation by source in 2012: Hawai'i vs. the U.S.

Energy Source	HI	U.S.
Coal	15	37
Natural Gas	0	30
Nuclear	0	19
Petroleum	71	< 1
Hydro	1	7
Wind	4	3
Biomass/Wood	3	4
Geothermal	2	< 1
Solar	< 1	< 1
Other	3	< 1

Note. Source: U.S. Department of Energy, Energy Information Administration (2014b)

Figures for solar do not include power generated from net metering of residential PV or electricity offset provided by solar water heating.

METHODS AND RESULTS

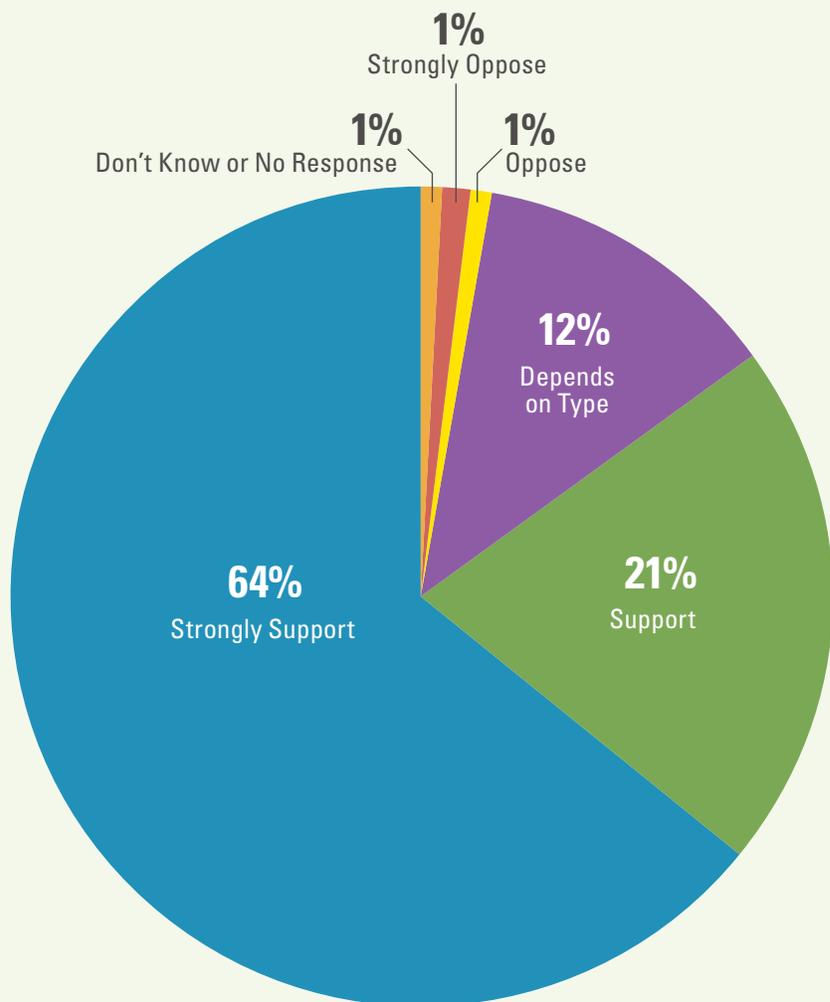
A telephone survey of 1,214 resident Hawai'i adults was conducted in 2012. The sampling frame and data weights were designed to provide results that were representative of the state as a whole as well as of each county. The margin of error for state-level estimates was 2.9 percentage points. The sixteen-item survey included both traditional forced-choice questions and open-ended questions intended to provide a more nuanced view of respondents' attitudes.

Acceptability of different forms of energy generation in Hawai'i

The overall level of support for renewable energy was very high. The large majority of the public was supportive or strongly supportive of "developing more renewable energy sources for the State of Hawai'i." An additional 12% supported particular types of renewables, and only 3% of the public was opposed to or had no opinion about RE (see Figure 1).

Respondents were then asked whether each of six different types of RE and three conventional forms of energy production would be "good for Hawai'i." Four distinct clusters were found, based on statistically significant differences in degree of public approval (see Figure 2). Solar and wind power were the most widely accepted RE technologies (with 92% and 86% favorable opinion, respectively), followed by hydroelectric (76%) and geothermal power (75%). Municipal waste (58%) and biomass combustion (53%) were less widely endorsed but were still acceptable to the majority of residents. Only a small segment of the public endorsed conventional sources of electricity generation—nuclear (22%), oil (13%), and coal (12%).

Figure 1: Level of support for developing more sources of renewable energy in Hawai'i



Thoughts about renewable energy

After rating their overall level of support for renewable energy, respondents were asked to explain their response. These comments were recorded verbatim and subjected to a content analysis. Emerging themes from this analysis and sample comments are shown in Table 2.

Most of the themes addressed concerns for the environment and sustainability. These included taking advantage of Hawai'i's abundant natural resources (12% of comments), the consequences of RE (usually positive, but sometimes negative) for the environment (17%), the need for energy independence (13%), reducing reliance on fossil fuels (11%), and planning for the future (4%). Although the category of miscellaneous responses was large (21%), most comments thus coded were unqualified

statements in support of RE, e.g., "It's a no-brainer." Economic considerations were addressed in themes relating to the high cost of conventional energy (25%) and effects of RE on the local economy (4%). Issues relating to levels of public knowledge (8%), distrust of the utility companies or political systems (5%), and Native Hawaiian or lifestyle concerns (1%) were also raised.

To obtain a sense of priority, respondents were also asked, "What is the most important issue to you when considering how you feel about renewable energy?" The telephone interviewer classified each response into one of four predetermined categories. Cost emerged as the single most important issue (35%), followed by concerns for the environment (26%), potential impact on employment (4%), and other reasons (19%). A reasonably large proportion of respondents (16%) did not identify a main issue.

Differences in attitudes as a function of location and social characteristics

We examined respondent gender, age, education, and county of residence as possible correlates of attitude towards RE. For the most part, attitudes were highly uniform across segments of the population. There were no regional differences in attitudes. Respondents with a graduate degree were more supportive of RE overall and of both solar and nuclear power than were those with a high school education or less. These highly educated respondents also viewed oil more favorably than did those with a college degree. Men were more favorable than women towards geothermal, oil, and nuclear power. Respondents age 65 or older tended to be the least supportive of wind power and hydropower, but were more supportive of biomass combustion than were young adults. The magnitude of each of these group differences, however, was quite small.

Figure 2: Acceptability of energy generation options

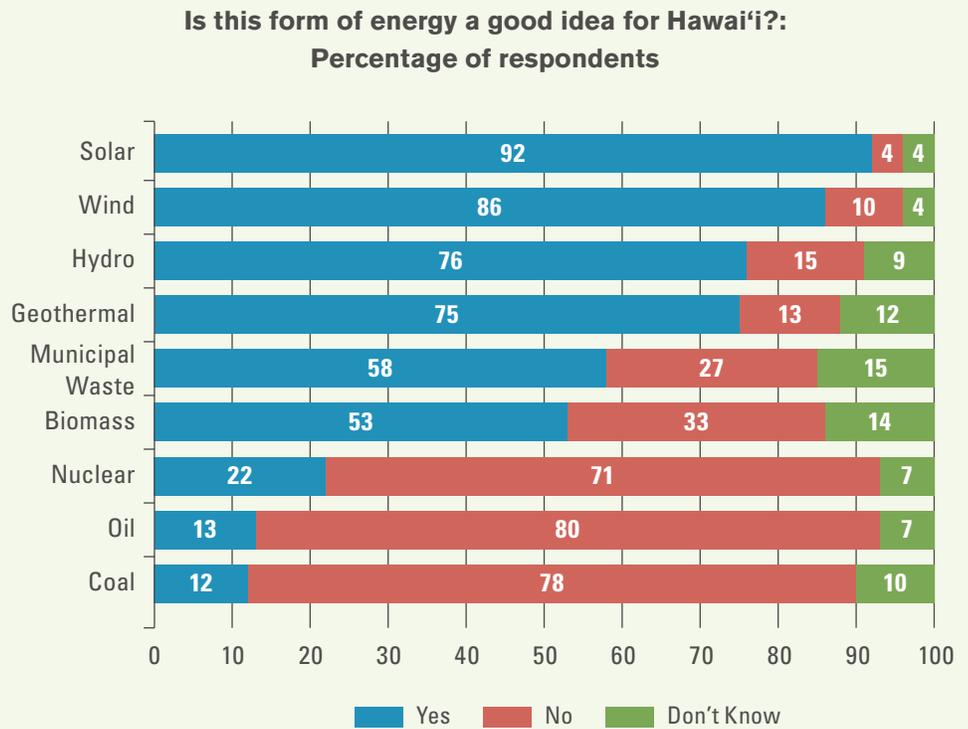


Table 2: Themes regarding support or lack of support for RE

Theme	Percentage of Comments	Sample Responses
Cost of energy	25	<ul style="list-style-type: none"> • <i>Our current prices for utilities and gas are the highest in the country. We're desperate.</i> • <i>We can't afford not to. How's your HECO bill these days?</i>
Miscellaneous	21	<ul style="list-style-type: none"> • <i>It's the right thing to do.</i> • <i>It's common sense.</i>
Effect on environment	17	<ul style="list-style-type: none"> • <i>It's cleaner, less impact on the environment.</i> • <i>It's sickening to see our society and civilization use and abuse natural resources for their own gain. [We] don't respect the earth and the way it works. Doing more damage than good. We can do better with wind, solar, and other natural energies to restore the balance between humans and Mother Nature.</i>
Energy independence	13	<ul style="list-style-type: none"> • <i>Hawai'i is very isolated so we need to be able to generate more of our own energy.</i> • <i>Sustainable approach rather than relying on foreign outside energy.</i>
Availability of natural resources	12	<ul style="list-style-type: none"> • <i>We have wind. We have waves. We have tidal movement. Geothermal trumps them all. I'm in Hilo; 30–40% of energy comes from thermal. A lot of untapped resources. Get free electricity from Mother Pele.</i> • <i>We have all the natural elements to make us energy independent. We are more blessed than the other states.</i>
Decrease use of fossil fuel	11	<ul style="list-style-type: none"> • <i>We need to get away from fossil fuel.</i> • <i>We need to get off oil.</i>
Knowledge or attitudes	8	<ul style="list-style-type: none"> • <i>I'm a participant. I have solar hot water and electric. I'm a believer: I walk the walk and talk the talk.</i> • <i>I don't have enough information about some of the reusable resources. Solar is all that I know of.</i>
Renewable energy types	8	<ul style="list-style-type: none"> • <i>I'm a bit concerned about some of the geothermal energy.</i> • <i>The wind farms come to mind: They are ugly.</i>
Business or political systems	5	<ul style="list-style-type: none"> • <i>Electrical and oil are dinosaurs. The other alternatives are the future. The only problem is that the dinosaurs control our money.</i> • <i>Too many politicians and kickbacks.</i>
Concerns for the future	4	<ul style="list-style-type: none"> • <i>I want my kids to be able to live here.</i> • <i>There aren't any other options for the future. You can't make any more petroleum products.</i>
Effect on the job market or local economy	4	<ul style="list-style-type: none"> • <i>It would provide more jobs and boost the local economy.</i> • <i>Jobs.</i>
Native Hawaiian culture or local lifestyle issues	1	<ul style="list-style-type: none"> • <i>The sacred burial ground, that can be an issue.</i> • <i>If they take away the beach because [of renewable energy] I would oppose it. If they block off the hunting areas, then I would oppose it.</i>

Note. Percentages do not sum to 100 because some respondents commented on multiple themes.

Content analysis was conducted on raw, unweighted data.

DISCUSSION AND IMPLICATIONS

Hawai'i residents were highly positive about RE: 85% of adults in the state supported increased development of RE in the state and 97% had favorable views regarding at least some forms of RE. Solar and wind power enjoyed the highest level of public regard, at 92% and 86%, respectively. Hydro and geothermal energy were endorsed by three quarters of the public, and biomass and municipal waste combustion were viewed favorably by more than half of the population. This is in stark contrast to views on conventional forms of power generation—oil, coal, and nuclear—which are supported by only 13–22% of the Hawai'i public. Support for RE was motivated by a blend of concerns for environmental protection, sustainability, and energy independence and by frustration with high local energy prices.

The present results are strikingly consistent with figures reported from national polls in the U.S. and Europe. This similarity includes findings regarding support for RE vs. conventional energy, the rank order of particular RE technologies, and differences in views as a function of gender and education (Department of Trade and Industry, 2003; Devine-Wright, n.d.; McGowan & Sauter, 2003; National Renewable Energy Laboratory, 2011). Across these studies, RE is viewed much more favorably than conventional energy sources; furthermore, solar, wind, and wave/tidal technologies (when included) receive high levels of public recognition and approval.

It has been suggested that opinions are most favorable toward familiar technologies, especially when these technologies are located in respondents' own communities (Department of Trade and Industry, 2003). Our results were only partially consistent with this pattern. Solar and wind power, the most popular RE forms, are the largest contributors to Hawai'i's RE portfolio. On the other hand, hydropower was perceived more favorably than biomass or waste combustion even though combustion generates more than ten times as much power for our state (Hawaiian Electric Company, n.d.). Our counties vary widely in terms of the composition of the local energy portfolio. Hawai'i and Maui counties generate by far the largest proportion of electricity needs from renewable sources (48% and 29%, respectively) (Hawaiian Electric Company, 2014). Each county also differs in terms of which form of RE generates the most power: geothermal for Hawai'i County, wind power for Maui County, biomass/waste combustion for Honolulu County, and hydroelectric power for Kaua'i County (Kaua'i Island Utility Cooperative, 2013; Hawaiian Electric Company, 2014). Despite these differences in use, as well as the controversies over the proposed interisland transmission of wind power generated on Lāna'i and Moloka'i, we did not find county-level differences in public attitudes towards particular forms of RE.

Our poll also yielded somewhat different themes than were found in public commentary collected for recent environmental impact statements (EIS) related to the HCEI. The EIS findings showed much more concern for Native Hawaiian and cultural issues, protecting vulnerable species, and whether particular wind and geothermal projects would benefit distant communities at the expense of the host locale (State of Hawai'i Department of Business, Economic Development, and Tourism, 2011b; U.S. Department of Energy, 2012). The different results may be related to the use of different research methods, e.g., the use of representative vs. self-selected samples and asking about general views on RE vs. collecting personal testimony regarding specific RE installations.

Solar and wind power enjoyed the highest level of public regard, at 92% and 86%, respectively. Hydro and geothermal energy were endorsed by three quarters of the public, and biomass and municipal waste combustion were viewed favorably by more than half of the population.



Photo Source: Hawaiian Electric Company

Opinion polls are useful in providing an overview of public attitudes that may be generalized to the target population at a particular point in time. Although our study served this function, many questions remain unanswered. We did not address the depth or accuracy of public knowledge about RE or conventional energy, individual experience with different RE technologies, actual energy-consumption or -conservation behaviors, or the salience of RE relative to other conservation or lifestyle concerns.

Evidence from other studies indicates that public knowledge about energy systems and RE technologies is quite limited and that many aspects of consumer opinion on these topics are factually inaccurate (McGowan & Sauter, 2005; National Environmental Education & Training Foundation, 2002). However, recent research suggests that the U.S. general public

- is highly supportive of energy education and regulations that promote RE and conservation,
- believes that conservation and economic development are not antithetical, and
- sees energy conservation as essential for the nation's economic well-being (National Environmental Education & Training Foundation, 2002).

Opinions about RE are most favorable among individuals who have more accurate knowledge and direct experience with a particular RE technology (Department of Trade and Industry, 2003; National Environmental Education & Training Foundation, 2002). Public support or opposition to specific RE installations or policies is also affected by the following:

- perceptions of environmental consequences,
- economic benefits,
- concerns for social justice,
- local vs. corporate ownership,
- the perceived trustworthiness of policy-makers and utility companies,
- whether affected citizens have a real say in decision-making processes, and
- the extent to which proposed changes will negatively or positively affect community identity and sense of place (Bergmann, Hanley, & Wright, 2006; Devine-Wright, 2011; Huijts, Molin, & van Wee, 2014; Warren & McFayden, 2010).

Widespread acceptance and adoption of RE innovations depends on a confluence of political and regulatory commitment, supportive market forces, and a knowledgeable and engaged citizenry (Sovacool & Ratan, 2012). The environmental, economic, and cultural stakes relating to energy systems in Hawai'i are high. Our residents are optimistic about the potential of RE technologies. The future for RE in Hawai'i will benefit from accurate and nuanced public education, along with mechanisms to ensure significant, ongoing community involvement in the development of energy policy and clean energy systems.

The future for renewable energy in Hawai'i will benefit from accurate and nuanced public education and significant, ongoing community involvement in developing clean energy policy and systems.



Photo Source: Institute for Local Self-Reliance

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