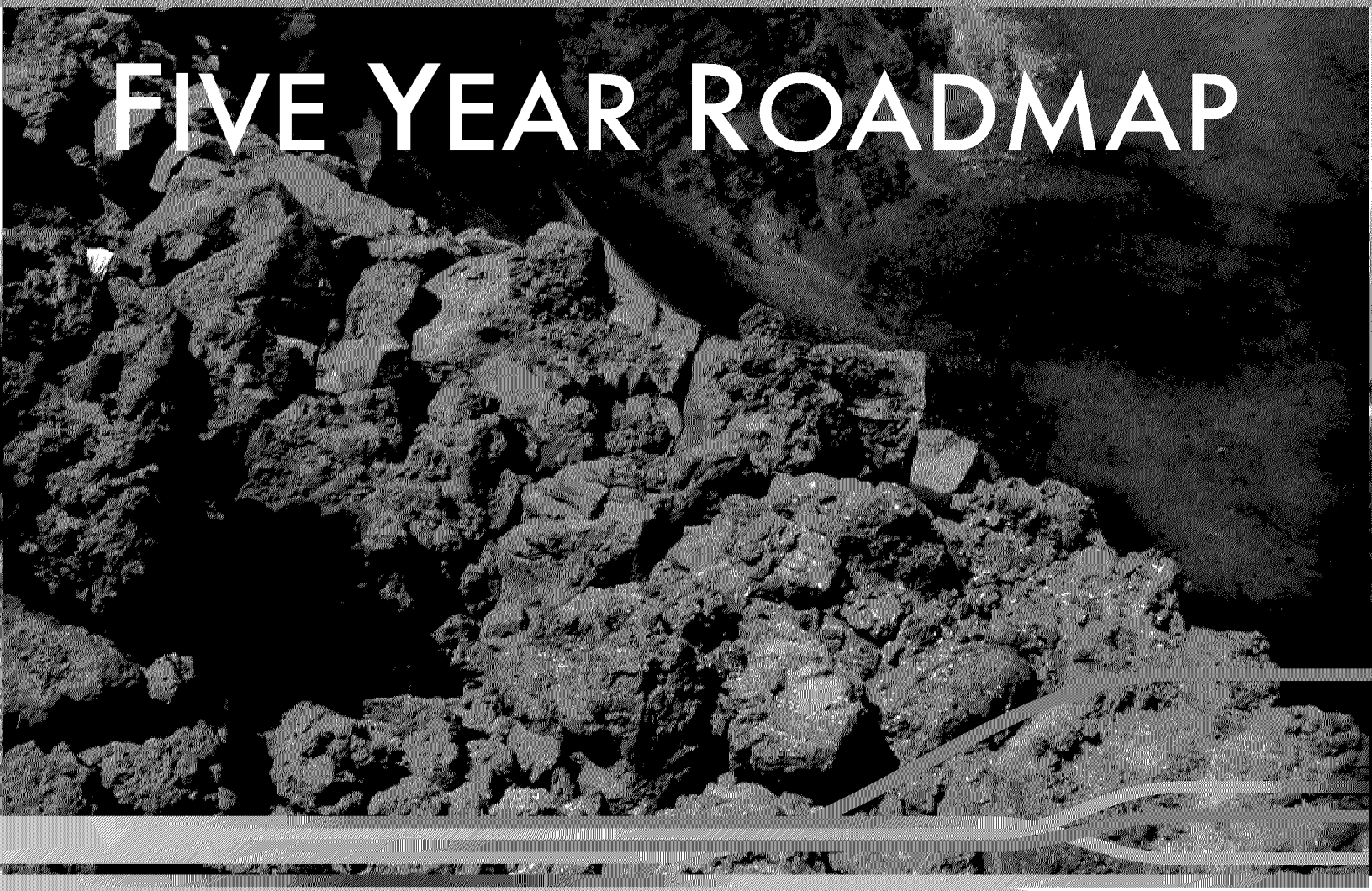
County of Hawai'i
Energy Sustainability Program

Five Year Roadmap



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Executive Summary

Overview

The Island of Hawai'i is a leader in adopting renewable energy technologies. Renewable energy generated from geothermal, hydropower, wind, and solar resources accounted for more than 37% of electricity production in 2011, on track to exceed statewide goals for 2030. However, this renewable production represents just 5% of the island's total energy use, due to generation and transmission losses in the electric power system and the large energy needs of the transportation sector. Despite the successes of the past 30 years, today the island remains overwhelmingly dependent on imported petroleum fuels.

The citizens of the island have a compelling interest in eliminating this dependence due to the instability of the petroleum markets, the insecurity of imported energy, the danger of a crippling environmental or natural disaster, and more recently, the high and volatile price of petroleum products. Hawai'i Island residents routinely pay some of the highest energy costs in the country, which diminishes the competitiveness of local businesses and imposes a particular burden on low-income households. The impacts of energy dependence are linked to many other aspects of island life including agriculture and local food production, civil defense, water supply, tourism, and land use decision-making.

Energy sustainability is an alternative to the island's current petroleum dependence, relying on local, renewable resources to meet the energy needs of the island's residents and power the island's economy. Energy sustainability does not just mean independence and self-sufficiency; it also means ensuring energy resources are available indefinitely and using them in a way that does not degrade the environment, compromise public health, or disrupt the economy.

Because of their isolation and constrained resources, islands are laboratories for sustainability that can provide valuable lessons for the mainland United States and the rest of the world. Hawai'i Island in particular is well situated to demonstrate the benefits of energy sustainability due to the vast renewable energy potential of the island relative to the modest scale of its energy system. The technologies to capture these renewable resources are commercially available today and in many cases are now more cost effective than petroleum-based energy.

However, pursuing energy sustainability is an enormous undertaking. The island's energy system cannot be quickly or easily adjusted given the current overwhelming dependence on imported energy, the uncertainty of future conditions, the long timeline associated with an energy transition of this magnitude, and the local government's current limited authority over the island's energy system. The road to a sustainable and secure energy future for the Island of Hawai'i requires leadership from the County and collective efforts of households, businesses, communities, and other stakeholders throughout the island. The County of Hawai'i has a key responsibility to help the island meet this formidable challenge.

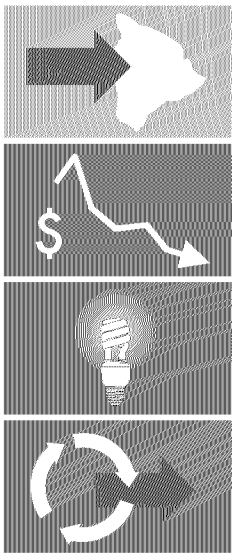
OBJECTIVES

The overall objectives of the *County of Hawai'i Energy Sustainability Program Five Year Roadmap* are to describe the critical role of the County of Hawai'i in the pursuit of the island's sustainable energy future and to provide the County with a set of high-priority policies and programs in the areas of renewable electricity, energy efficiency, and transportation systems. The scope of the roadmap is focused on the implementation details of specific, actionable recommendations for programs the County can legally undertake today. The roadmap can also serve as an informational resource with data and analysis on the functioning of the island's energy system for use by government, the private sector, and individual stakeholders.

The *County of Hawai'i Energy Sustainability Program Five Year Roadmap* describes the challenges, highlights the opportunities, and suggests the highest priority actions the County of Hawai'i can take to lead the island to energy sustainability. Although limited by state law, by implementing the Priority Actions described in the roadmap, the County can help determine the future of the island's energy system, protect the interests of island residents, and ensure the appropriate development of the island's land and other resources. Simultaneously, the roadmap actions can generate significant cost savings to re-invest in a variety of new policies and programs, including returning cost savings to the County General Fund to help contribute to all other county programs.

GUIDING PRINCIPLES

There is no single path to achieving energy sustainability, and some options may not be acceptable to the island's residents. Therefore, the strategies and recommendations in the roadmap are designed to be consistent with four guiding principles derived from the County of Hawai'i General Plan, the Hawai'i State Plan, and Hawai'i state law.



- Eliminate the island's reliance on imported fossil-based energy and replace it with sustainable and secure energy sources
- Reduce the price paid for energy services on Hawai'i Island
- Maintain the reliability and safe operation of the island's energy infrastructure
- Encourage innovation, invest in healthy communities, and respect the natural environment

FIGURE 1. GUIDING PRINCIPLES FOR THE COUNTY OF HAWAI'I ENERGY SUSTAINABILITY PROGRAM FIVE YEAR ROADMAP

Energy Sustainability for the Island of Hawai'i

Hawai'i Island has the renewable resources to meet all of it's energy needs, but energy sustainability is such a departure from the status quo that it will take many years until the energy system can realistically be expected to transition from petroleum dependence to complete self-reliance. In addition to the long timeline associated with this transformation, energy sustainability could take many forms, depending on changes in technology, global markets and state and federal law as well as decisions that are made about the preferred energy future for the island.

Uncertainty about future conditions does not mean that a "wait and see" strategy is best. Petroleum dependence is already impacting the island and there is broad support for pursuing energy sustainability. However, there are significant technical, economic, and political challenges that have so far limited energy independence after decades of effort. Key challenges include the overwhelming reliance of the transportation sector on imported petroleum products, the costs of financing some technology options, the challenge of grid interconnection and power system operations, and the lack of effective government policies and coordination to ensure new energy projects are implemented.

Petroleum Dependence

The island is reliant on imported petroleum fuels for 95% of its energy needs. Rising, volatile energy prices impose a burden on many sectors of the island's economy, and the high cost of energy disproportionately impacts low-income households. This equity issue could become more acute over time. Overcoming this dependence will require aggressive and sustained efforts from many stakeholders throughout the island for many years.

Importance of Transportation

Transportation presents the greatest challenge to energy sustainability for the island because this sector constitutes more than half of energy demand and the market development of sustainable transportation solutions has been slow.

Deploying Low-cost Renewable Electricity

Renewable electricity generation costs less than the current petroleum-based electricity generation on the island. These technologies are commercially available today and should be widely deployed alongside a modernized power grid. Regulatory policy may need to change to facilitate rapid deployment.

The Role of the County

The County's authority and jurisdiction over the energy system is limited by state law, but the local government still has a responsibility to protect the interests of island residents in energy policy decision-making. The County can lead the transition to sustainable energy and also save significant taxpayer dollars by investing in high rate-of-return energy projects for County operations.

Figure 2. Key Energy Sustainability Considerations

Petroleum Dependence

Unlike most of the United States, Hawai'i Island (and the rest of the state) relies almost entirely on petroleum fuels, not just for transportation, but also for electricity production and even cooking and heating. In 2010, about 95% of the 26,899 terajoules (TJ)* of energy consumed on the island was imported in the form of petroleum fuels such as motor gasoline, distillate fuel oil (diesel), naphtha, residual fuel oil, aviation fuels, and liquefied petroleum gas.† Almost every barrel of petroleum was imported into the state from international sources far from the islands.[1] Just 5% (1,369 TJ) of the energy needs of Hawai'i Island's residents, businesses, and visitors are met through locally produced renewable energy sources, which currently consist of renewable electricity produced from geothermal, wind, solar, and hydropower resources.

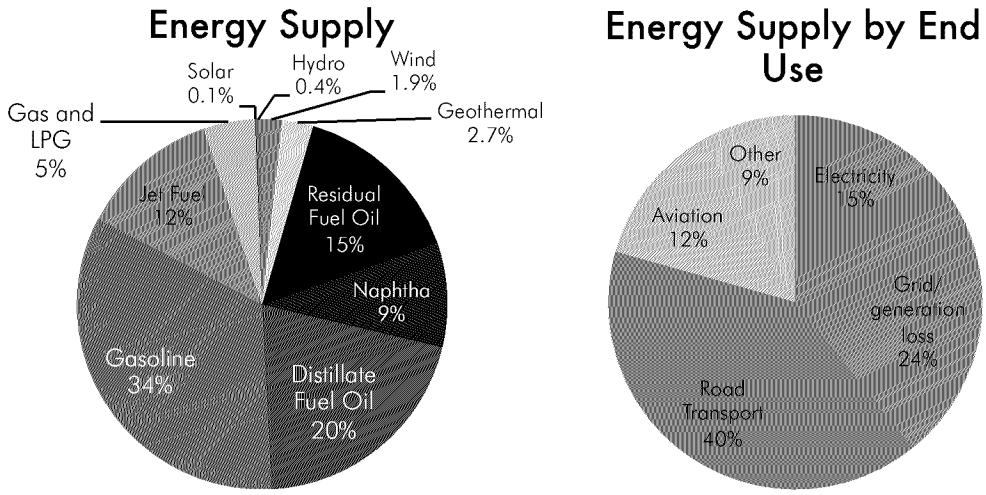


Figure 3. Hawai'i Island Energy Supply and End Use, 2010‡

Energy Prices and Expenditures

The island's residents, visitors, businesses, and government spend more than $920 million on energy purchases in 2011, with electricity and transportation each accounting for about half of the total.§[2] Over the past six years, electricity prices have risen by over 40%, while consumption has remained flat. Hawai'i Island electricity prices are 35% higher than those on O'ahu, and exceed the

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* One terajoule is equal to 1 trillion joules, or about 948 million Btu (British thermal unit). This is approximately equal to the energy content of 163 barrels of crude oil or the electricity required to light a 13-Watt compact fluorescent light bulb for 2439 years.

† Calculation by The Kohala Center. See: Appendix F

‡ Grid/generation loss refers to energy losses during combustion-based electricity generation and system-wide transmission and distribution losses. Calculation by The Kohala Center. See: Appendix F.

§ Includes taxes and excludes off-highway diesel and other fuels whose pricing data is not tracked. Estimates for aviation fuels use West Coast average prices.

mainland average by more than 300%. Over the same period, motor gasoline prices have increased over 48% and diesel prices have increased 58%. Gasoline and diesel prices are at least 25% higher than the mainland average. [2,3]

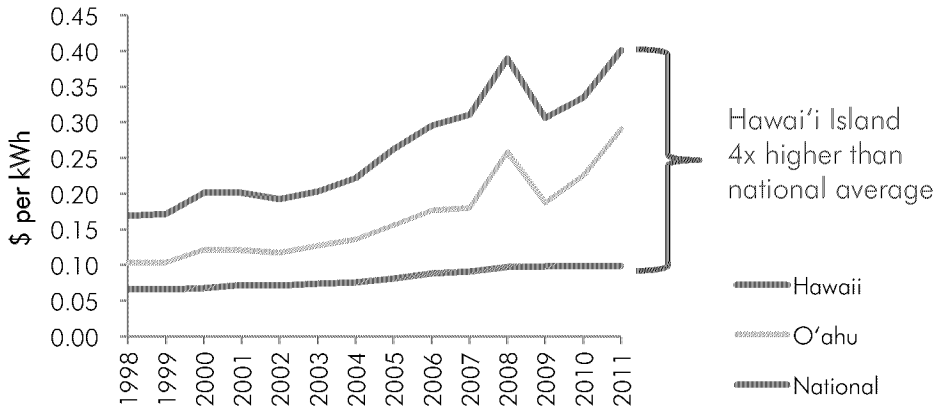

FIGURE 4. AVERAGE ELECTRICITY PRICES; HAWAI'I ISLAND, O'AHU, US AVG., 1998-2011[4]

Energy-related expenditures are a particular burden on low-income households because they cannot easily reduce consumption in the face of rising prices. On Hawai'i Island, low-income households spend more than twice as much of their income on electricity than the average island household (Figure 5). Hawai'i Island has a higher proportion of low-income families than O'ahu (17% compared to 11%), and a smaller proportion of upper-income families (30% compared to 40%).* The median household income on Hawai'i Island is 27% lower than on O'ahu.

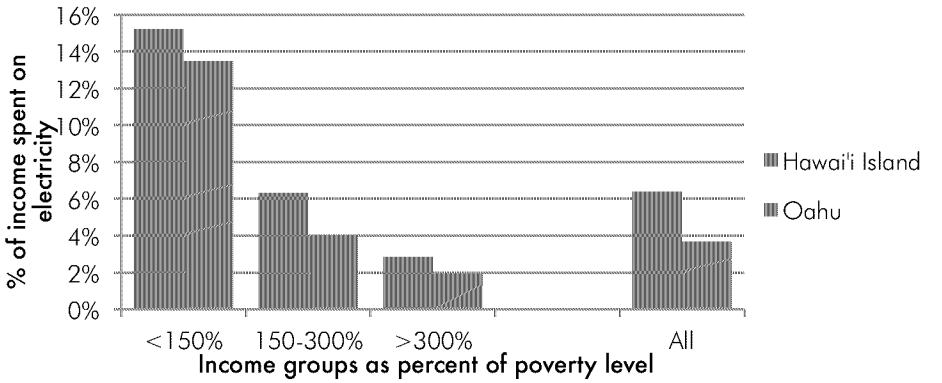

FIGURE 5. HOUSEHOLD ELECTRICITY EXPENDITURES BY INCOME GROUP, 2009[5]

The burden of rising energy prices may fall disproportionately on low-income customers if wealthier households are able to afford to install renewable energy generation or energy efficiency improvements. Since the utility is currently

* "Low-income" classified as being at or below 150% of the federal poverty level for the state as determined by the Department of Health and Human Services. For example, in 2010 a four-member household that made less than $25,360 is considered to be "in poverty"; up to $38,040, the household would be considered "low-income."

permitted to impose limits on the amount of customer-sited or variable generation the system can accommodate, these higher-income customers are better able to enjoy cost benefits that may not be available in the future.

Importance of Transportation

The transportation sector (both ground and aviation) requires special emphasis because it is not well represented in the major energy policy and decision-making processes, despite accounting for more than half of Hawai'i Island's energy demand. A complete transition to energy sustainability in transportation will require the efforts of a large number of stakeholders (such as car dealers, fuel suppliers, and distributors) that are not regulated or integrated in the same way as electricity sector stakeholders.

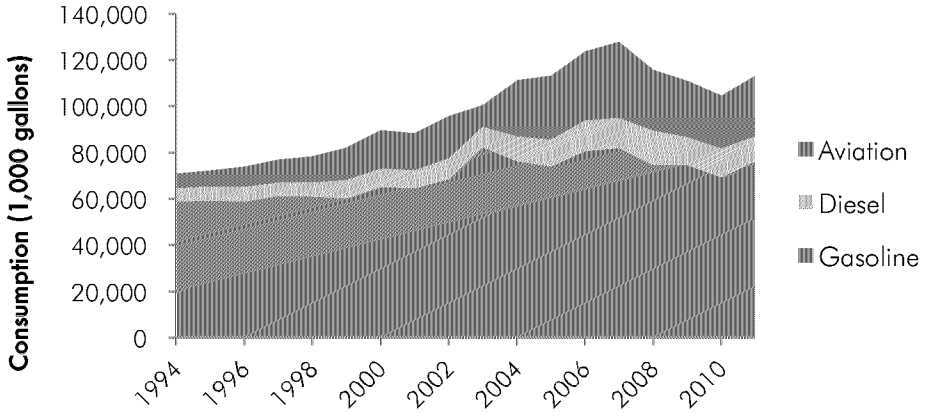

FIGURE 6. TRANSPORTATION FUEL CONSUMPTION, HAWAI'I COUNTY, 1994-2010[6]

In 2010, Hawai'i Island consumed more than 100 million gallons (14,000 TJ) of ground transportation fuel, about 74% more per capita than O'ahu.[6] Gasoline consumption alone exceeds 200,000 gallons per day. The island's size, rugged terrain, and high proportion of light-duty trucks contribute to a vehicle stock that has the lowest efficiency in the state at less than 17 miles/gallon (Figure 7).

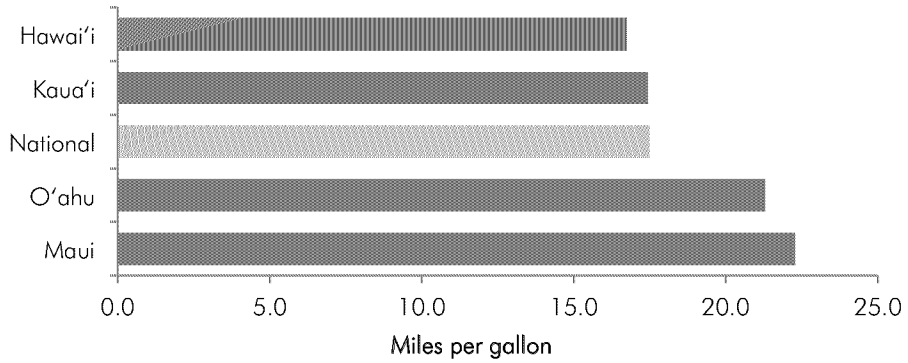

FIGURE 7. FUEL ECONOMY BY ISLAND AND NATIONAL AVERAGE, 2010[7,8]

Energy sustainability for transportation requires both changing the energy sources used and reducing the total energy consumed by increasing the efficiency of vehicles, reducing the distances traveled, and moving travelers to more efficient modes of transportation.

In the future, electric vehicles will be an essential part of energy sustainability because they are significantly more efficient per vehicle-mile than conventional engines and they can be powered by electricity from any renewable source. As a result, the operating cost per mile of an electric vehicle on Hawai'i Island is already 47% lower than the average internal combustion vehicle, even after accounting for the island's extraordinarily high electricity prices (Figure 8).

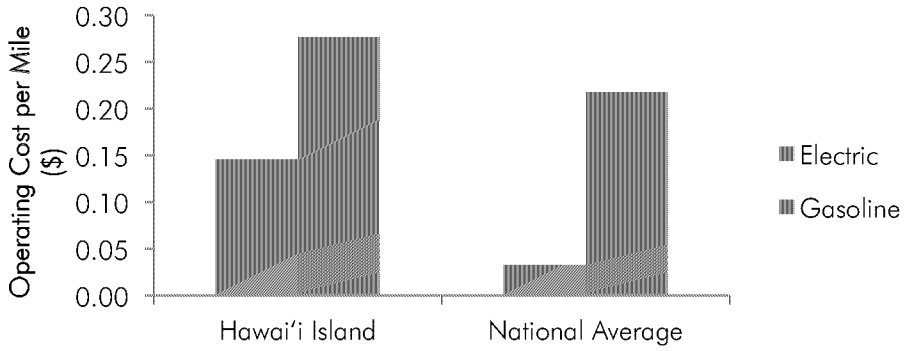

FIGURE 8. OPERATING COST PER MILE FOR ELECTRIC AND INTERNAL COMBUSTION ENGINE VEHICLES, 2011 PRICES.*

Today, less than 1% of registered taxable vehicles are hybrid or electric.[2] The vehicle stock also has a slow turnover (>25 years),† meaning that much of the existing inefficient vehicle stock will persist for decades to come. The limited availability of electric vehicles on the market and the slow turnover of the island's vehicle stock indicate that a transportation system running on sustainable energy will depend on the availability of alternative fuels such as biofuels that can run in conventional vehicle engines.

Estimates of the quantity of biofuels that can be produced on Hawai'i Island vary widely, depending on what portion of existing agricultural land is assumed to be converted to biofuels production. The promise of a reinvigorated agricultural industry that simultaneously reduces energy dependence makes support and development of a biofuels industry a goal of many business, community, and political leaders. Much of Hawai'i Island is not suitable for growing biofuels, however, so competition for high-quality, irrigated land could become an issue.

More efficient modes of transportation are already available and affordable on the island, including mass transit, biking and walking. However, only 1.7% of workers report using the mass transit system to get to work,[9] suggesting that the current system does not serve the needs of most commuters. Further, biking and walking are limited due to the low development density of the island, its challenging terrain, and a lack of dedicated sidewalks and bikeways.

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* Operating cost excludes lifetime maintenance due to lack of available data. Anecdotal evidence suggests maintenance costs for electric drivetrains are significantly lower than for conventional vehicles. See: Appendix F.

† Vehicle turnover rate indicates the relationship between the size of the existing vehicle stock (172,000 vehicles) and the number of new vehicles sold each year (typically <5,000 new vehicle sales). See: Appendix F.

Deploying Low-cost Renewable Electricity

Renewable sources collectively provided about 37% of electricity generation in 2011 on Hawai'i Island, with the remainder coming from residual fuel oil, naphtha, and diesel. Nationally, only about 13% of electricity generation is from renewable sources.[3] The Island of Hawai'i possesses vast untapped potential for electricity generation from renewable resources. Estimates vary, but the total available renewable resource far exceeds current electricity demand, which had a peak of 190.6 MW in 2010.[10]

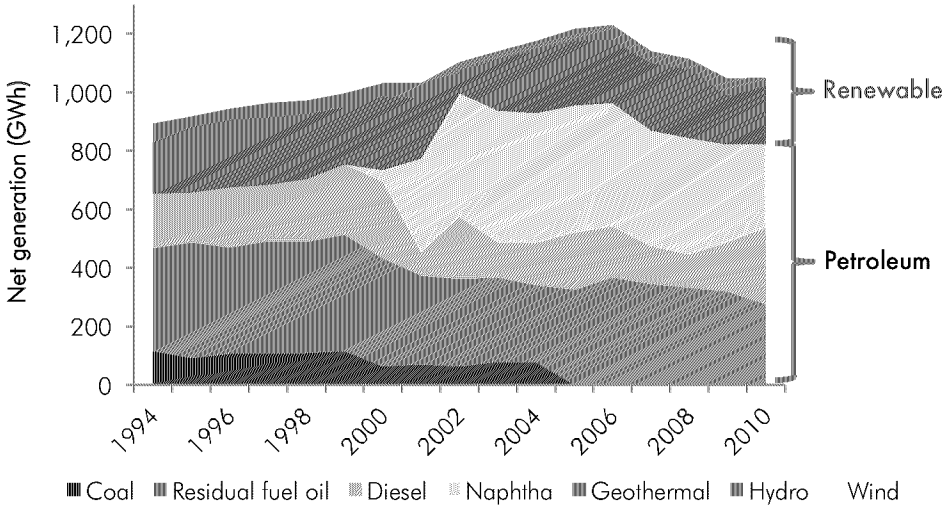

FIGURE 9. ELECTRICITY GENERATION BY SOURCE, 1994 – 2010*[11]

The island's electric power system is owned and operated by Hawaii Electric Light Co., Inc. (HELCO).† The State of Hawai'i grants HELCO a non-exclusive franchise for electric utility service, and the company operates as a monopoly regulated by the Public Utilities Commission. HELCO served 80,170 customers and delivered 1,194,000 megawatt-hours (MWh)‡ of electricity to the power system in 2010.[2] Between 2007 and 2010, electricity sales actually decreased by an average 1.3% per year, reversing the earlier trend from 1994 to 2007 when sales increased an average of 2.9% per year.[4]

In the past, the high capital cost of renewable technologies did not compare favorably with the relatively low prices of petroleum products. The existing energy infrastructure was already based on petroleum and other fossil resources and replacing it was infeasible and uneconomical. Today, many renewable energy technologies have matured to the point that they can now compete with current

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* Excludes customer-sited generation, which is not typically metered.

† HELCO is a subsidiary of Hawaiian Electric Co. (HECO), which also owns the power systems on O'ahu, Maui, Moloka'i, and Lana'i. HECO itself is a unit of Hawaiian Electric Industries, Inc. (HEI), a company publicly traded on the New York Stock Exchange (symbol HE).

‡ One megawatt-hour is the energy provided by one megawatt of power for a duration of one hour. One megawatt is equal to 1 million watts. Note: About 7% of energy delivered to the system is lost during transmission and distribution.

electricity prices. Reducing overall electricity costs by taking advantage of the low cost of renewable electricity generation will require adding relatively large amounts of new renewables to displace existing petroleum-based generation.*

As shown in Table 1, some renewable technologies use variable resources such as the wind and sun and thus cannot alone replace firm resources. Safety and reliability are also important considerations that may affect the feasibility of different technologies, particularly with respect to known hazards such as seismic, volcanic, and other risks present on Hawai'i Island.†

TABLE 1. COMPARISON OF GENERATION TECHNOLOGIES[2,12,13]

	Generation Cost	Firm Resource	Commercially Available
HELCO production	Status Quo	Firm	Yes
Solar PV	Lower	Variable	Yes
Wind	Lower	Variable	Yes
Geothermal	Lower	Firm	Yes
Hydropower	Lower	Variable‡	Yes
Biomass	Lower	Firm	Yes
Waste to Energy	Lower	Firm	Yes
Energy Efficiency	Lower	Variable	Yes
Ocean	Unknown	Firm	No

Note: Technology characteristics based on most recent available cost estimates from National Renewable Energy Laboratory and Hawai'i-based energy developers. Individual project costs will vary based on many factors. Specific project proposals should be evaluated on a case-by-case basis.

ENERGY EFFICIENCY

Energy efficiency improvements can be viewed as a renewable energy resource because they reduce overall demand, most of which comes from petroleum. If the residents, businesses, and government of Hawai'i Island take steps now to improve energy efficiency, it could dramatically lower the overall cost of transitioning the island's energy system to renewable sources. Energy efficiency improvements are often the most cost-effective energy investments. There is already a ratepayer-funded program branded as "Hawai'i Energy" to address residential and commercial energy efficiency.

Because of the energy losses during power generation, switching to renewable sources can also save large amounts of imported energy. The island's existing petroleum-fired electric generators are only about 32% efficient on average,[11] which means that renewable technologies not only displace kilowatt-hours of electricity, they also displace large amounts of imported petroleum products used in conventional generation. Replacing petroleum-based generation with renewable generation could save some or all of the more than $120 million in

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* Adding new, lower-cost renewable generation will also have the effect of lowering the utility's avoided cost of energy, which will decrease payments made to independent power producers under current contracts.

† For additional discussion of natural hazards on Hawai'i Island, see *Seismic, Volcanic, and other Natural Hazards*, below.

‡Hydropower can be a firm resource but the existing units on Hawai'i Island are variable or "run of river."

spent on fuel purchases for power generation in 2011.[14] Eliminating power generation and grid losses would reduce the island's total energy consumption by 24%.

Electricity Markets and Regulation

The relatively low cost of renewable electricity provides a powerful market signal, but it has not been sufficient to induce widespread adoption of renewable energy in the electricity sector. There are technical challenges associated with interconnecting some renewables into the current power grid; however, they have been successfully managed in other places by investing in a modernized power grid and using existing technologies and applications to improve control and efficiency of the power system. Regulatory, policy, and financial incentive issues remain the key barriers to a full transition to renewable electricity.

In general, the regulatory system needs to be designed to encourage the kinds of investments required to transition the island's energy system to sustainability. There have been significant changes in energy policy since the Hawai'i Clean Energy Initiative began in 2008, and state-level decision-makers continue to consider broad regulatory adjustments to accelerate the state's transition to clean energy. However, so far, these changes have not resulted in substantial additions of renewable energy on Hawai'i Island, suggesting continued policy innovation will be necessary to realize a full transformation away from petroleum dependence.

Role of the County of Hawai'i

Most of the planning and decision-making for Hawai'i Island's energy system is made at the state-level in Honolulu, either by the state legislature, the State of Hawai'i Public Utilities Commission, or by O'ahu-based Hawaiian Electric Industries, the owner of HELCO and the island's electric power system. State law limits the County's authority and jurisdiction to certain specific areas, which prevents the County from unilaterally restructuring the island's energy system. Nonetheless, the County has a critical role to play in facilitating appropriate renewable energy development and leading the island toward energy sustainability.

In the short term, the County should focus on building the capacity of its own energy program and directing its substantial energy expenditures into investments that will reduce costs to taxpayers. Over the long-term, the County can take action to guide the transition to energy sustainability by contributing to official decision-making processes and advising the island's communities about the impacts of energy choices being made off-island.

Promote Appropriate Energy Development and Use

The County has the ability to influence the path taken by actively participating in off-island energy decision-making processes. The primary formal venues for contributing to energy planning and decision-making are the proceedings of the Public Utilities Commission and the state legislature. The County can analyze

proposed laws, regulations, and energy development projects and help ensure local impacts are given due consideration by those who control the island's energy system. Effective participation in state-level decision-making will give a voice to the island in determining its own energy future. In the electricity sector in particular, it is important to ensure coordinated energy development because there is a limited need for new generation capacity (electricity demand is flat or falling) and power purchase agreements for new generation tend to last twenty years or more.

These analyses can also support County efforts for improving public understanding of benefits and costs of energy sustainability and contribute to other critical community-based initiatives such as the Community Development Plans. Further County-sponsored public outreach should be coordinated with the education efforts of other energy stakeholders.

Develop Innovative and Proactive Policy

The County must anticipate the challenges and issues that will arise around exploiting Hawai'i Island's natural resources for energy and constructing the island's energy system. The County can be prepared for new project developments by creating rigorous, succinct and comprehensible frameworks for analyzing energy issues to be used in local land use planning and permitting processes. The County can insist on community-supported and evidence-based decision making. Due to state law, the County has more leeway in directing the development of transportation policy and infrastructure for the island, in particular the mass transit system.

Lead By Example in County Operations

The County of Hawai'i spent over $35 million on electricity and fuel for its own operations in 2011.[15,16] Most of this ($19M) is spent by the Department of Water Supply on electricity to obtain and deliver water to its customers.* Even excluding the large Water Supply energy expenditure, government operations required more than $15 million for energy purchases in 2011, of which more than $7.8 million was used for electricity and $7.5 million for liquid fuels for transportation and equipment.

In addition, the County of Hawai'i provides essential services to the island that are dependent on energy for their continued operation (e.g., water supply, civil defense, public safety, etc.). Investments in renewable energy systems can improve the resilience of energy supply for essential government services, while simultaneously lowering costs to taxpayers.

Energy efficiency and renewable energy projects developed by the County for both electricity and transportation can result in substantial savings that more than pay for the cost of installation and operation over the life of the projects. These savings can be used to support both energy and non-energy policy efforts of the County.

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* The County of Hawai'i Department of Water Supply is a semi-autonomous agency governed by an elected Board of Water Supply, which administers the department's budget separately from the rest of the County.

Five Year Roadmap

The Five Year Roadmap describes the components of a strengthened County energy program and presents a set of County energy "Priority Actions" focused on developing innovative policies to more effectively lead the island-wide energy sustainability transition while modernizing County operations and facilities. The Roadmap has the potential to save nearly $4 million in County operations over the next five years after covering program and staffing costs.

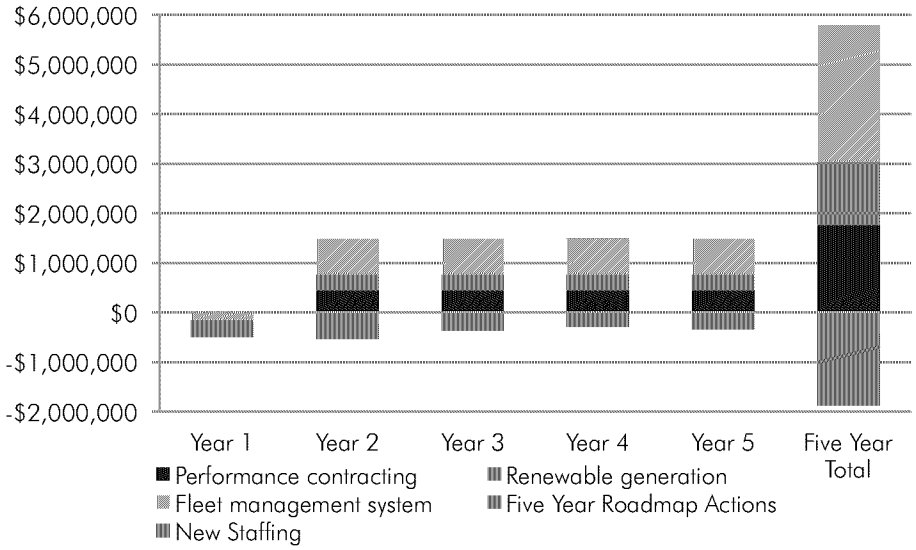

FIGURE 10. FIVE YEAR COST SAVINGS OF PROPOSED ENERGY PROGRAM

County Energy Program

An overview of the resources and general procedures for a energy program for the County are presented in the following sections, with key recommendations to:

- Create and empower a robust energy program with sufficient resources to provide leadership and coordinate energy initiatives across departments.
- Utilize energy savings to provide dedicated and predictable funding for the energy program through a revolving fund.
- Create a system for the accountability of the energy program through consistent documentation and reporting of activities and by restructuring County energy consumption and cost data collection and analysis.

Leadership and Resources

A central objective of the *County of Hawai'i Energy Sustainability Program Five Year Roadmap* is to provide not only recommendations regarding energy initiatives but also to outline the resources necessary for execution of those initiatives. The success of the Five Year Roadmap will require changing the status quo. Creating a strong and independent energy program would send a clear message that sustainability issues, particularly energy, are a core priority of the County and the current administration.

The County energy program should be led by an energy program manager with the ability to broadly coordinate energy initiatives across departments and represent the island's interests outside of county operations. Past projects have demonstrated that interdepartmental cooperation is essential, such as the successful solar photovoltaic system and electric vehicle program at the West Hawaii Civic Center primarily involving the Department of Research & Development, the Department of Public Works, and the Department of Finance. The energy program manager would be supported by both new and existing positions, the Energy Advisory Commission, and the interdepartmental task force known as the Green Team.

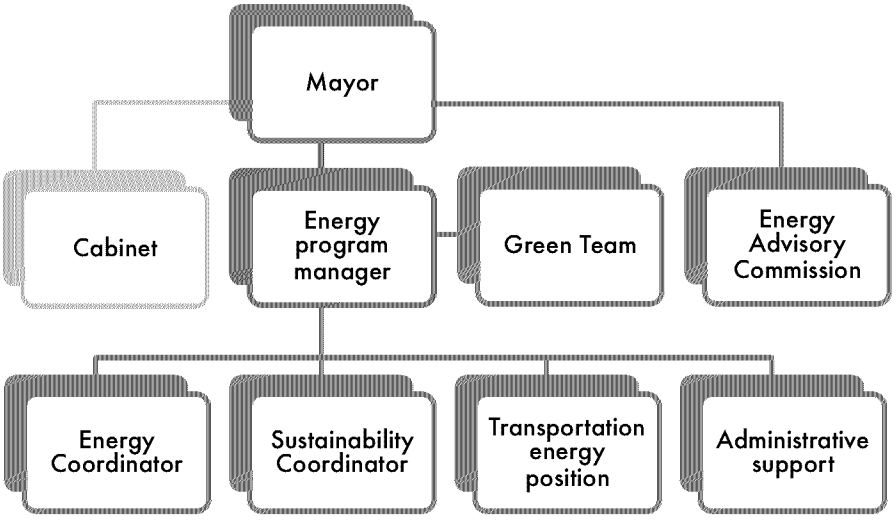

FIGURE 11. PROPOSED STAFF RESOURCES FOR THE COUNTY ENERGY PROGRAM

DEDICATED AND PREDICTABLE FUNDING

The cost savings generated from renewable energy projects can allow funds to be reallocated to support staff and new projects, but only if the appropriate tracking mechanisms are made part of the budget process. The majority of the savings can be directed to the General Fund to help support all County programs. However, a "revolving fund" should be established to capture part of the savings from energy projects to pay for the energy program staff and activities to assure and continue this cost-saving trajectory. The energy program staff should have responsibility for selecting appropriate projects for the revolving fund and accountability for achieving the necessary savings to cover their operating costs.

ACCOUNTABILITY

Quality data and reporting is necessary for effective decision making for energy programs and projects. Similarly, it is essential for tracking progress such as cost savings. At present, the County does not have a formal system to track, measure, or monitor energy consumption together with costs. Energy expenditures are recorded by the Department of Finance but there is no system of accountability for department heads to monitor and control energy use. Similarly, the public cannot easily get an understanding of how energy is used or paid for by its local government.

Accountability extends to the employees charged with implementing this roadmap and the energy program more generally. The Five Year Roadmap identifies what data sources currently exist and contains measurement guidelines that should be reliably tracked and reported to gauge the success of the energy program. The Five Year Roadmap and any other energy planning documents should be revisited regularly, updated on predictable schedules and coordinated with critical county decision-making processes such as the General Plan.

Summary of Priority Actions

Transportation

Reducing transportation energy demand and shifting to non-fossil energy sources will require long-term, concerted effort. In the short-term, the County of Hawai'i should organize its actions around mass transit system improvements, County-wide transportation laws and regulations, and County vehicles and operations. Additionally, the County can take steps to promote the adoption of new and better vehicles that consume little or no fossil fuel.

The County has several specific powers related transportation planning and regulation that can be leveraged to promote more sustainable and efficient use of energy in transportation. It also can wield influence as a major consumer of fuel on the island with total expenditures of about $7.5 million per year.

1. Coordinate the formation of a large fleet owners consortium
2. Fund a comprehensive mass transit strategic plan to increase ridership and introduce modern transit management technologies
3. Increase the user-friendliness of Hele-On bus information for riders
4. Provide grant funding to vehicle dealers and repair businesses to acquire and install electric vehicle servicing equipment
5. Create a property tax credit for electric vehicle charging stations
6. Establish a county-wide priority policy for alternative fuels
7. Adopt or develop a biofuels evaluation framework to support County decision-making and advocacy that addresses the specific needs of the island
8. Institute a fuel tax schedule for alternative fuels
9. Develop a framework for increasing the fuel tax on fossil fuels at a future date
10. Implement a Complete Streets policy to improve the safety and accessibility of the island's public roadways
11. Enforce the state law requiring large parking lots to provide electric vehicle parking and charging
12. Reduce fossil-fuel consumption in the County fleet through vehicle purchasing and a fleet management system
13. Encourage County employees to use an existing free private platform for carpooling and ridesharing.

Renewable Electricity

Public discussions about energy sustainability are often dominated by debates about the technology options and infrastructure development for electricity generation. The State regulates the development of power plants through law and the Public Utilities Commission. Because of this, the County is not in a position to select the projects that will be providing the majority of the island's energy in the future. However, it must ensure that energy development proceeds in a way that protects the welfare of residents and the environment.

In the short-term, the County of Hawai'i should maximize its own production of renewable energy allowed by current law, develop smart renewable energy policies designed to facilitate the orderly and appropriate development of the island's renewable energy resources, and support the deployment of technologies likely to help achieve the island's energy goals in the future.

14. Devote additional resources to representing the County's interest in Public Utilities Commission proceedings
15. Introduce an expedited permitting process for small solar photovoltaic systems
16. Institute a county-level review process for geothermal exploration and development that ensures a project is not materially detrimental to the public welfare and includes a public hearing
17. Expand the definition of the Geothermal Asset Fund and the Geothermal Relocation and Community Benefits Fund to address any future geothermal development
18. Release a master request for proposals for renewable energy generation and energy efficiency for all public facilities

Energy Efficiency

There are many ways to boost the island's economy and lower energy expenditures through energy efficiency investments. However, energy efficiency for homes and businesses is largely out of the hands of the County government. The immediate priorities of the County should focus on actions that it has explicit authority to carry out, are low or no cost and are not being carried out already by Hawai'i Energy, the rate-payer funded energy efficiency program. The County does have the ability to create policies through property taxes, building codes, and permitting. As one of the largest energy users on the island, the County can also lead by example with its own facilities and operations.

The County must be careful not to duplicate existing efforts or introduce new layers of programs and policies that only add to the complexity of implementing energy efficiency. The County should move away from direct funding towards design requirements and other enabling policies.

19. Adopt and maintain strong building energy codes
20. Create a building energy performance rating and disclosure program
21. Require independent commissioning for all new large commercial construction projects and major renovations
22. Restrict the solar water heater tax credit to existing buildings

23. Create a revolving energy fund to capture energy cost savings for reinvestment

24. Conduct energy service performance contracting for County facilities

25. Establish efficiency standards for County equipment purchases

Structure of the Five Year Roadmap

The *Energy Sustainability Program Five Year Roadmap* is oriented towards providing current and future County staff with analysis and recommendations towards strengthening the County energy program.

The document is organized into five major chapters:

- Executive Summary (this chapter)
- Energy on Hawai'i Island
- Long-term Vision: Energy Sustainability
- Role of the County of Hawai'i
- Five Year Roadmap

Executive Summary

This chapter provides a brief overview of the analysis and conclusions that inform the Five Year Roadmap. More detail on the major points highlighted here can be found in the rest of the document.

Energy on Hawai'i Island

This chapter discusses the current energy challenge by describing energy prices, expenditures, and the sources and uses of energy produced and consumed on the island. It also outlines the evolving policies and decision-making processes that affect energy in the state and on Hawai'i Island.

Long-term Vision: Energy Sustainability

Achieving energy sustainability will take many years and there is great uncertainty about how this transition will be accomplished, but there are some indications of the opportunities for spurring transformations in the energy system and the general approaches likely to be helpful moving the island forward. The chapter provides a summary of the island's renewable resource potential, along with experience from past successes and challenges. Major obstacles to continued progress are also examined in this chapter.

Role of the County of Hawai'i

The County has a key responsibility to coordinate development of the island, including that of its energy system, in a way that ensures the wellbeing of the island's residents. Though limited by state law, the County can proactively facilitate the transition to energy sustainability by participating in off-island decision-making, developing its own energy policies for the island, and leading by example in its own facilities and operations.

Five-year Roadmap

This chapter is the core of the Energy Sustainability Plan. It contains the strategies available to the County for influencing the course of energy development on the island and improving its own functioning. Each of the specific policy recommendations—or Priority Actions—is introduced in one of three categories: transportation system improvements, renewable electricity, and energy efficiency.

Energy on Hawai'i Island

This chapter examines the energy system of the Hawai'i Island, including the technical characteristics of energy needs of the island (energy demand); the sources of energy supplied to the system; and the energy policy and regulatory context that establishes energy markets and frames investment decisions.

Petroleum Dependence

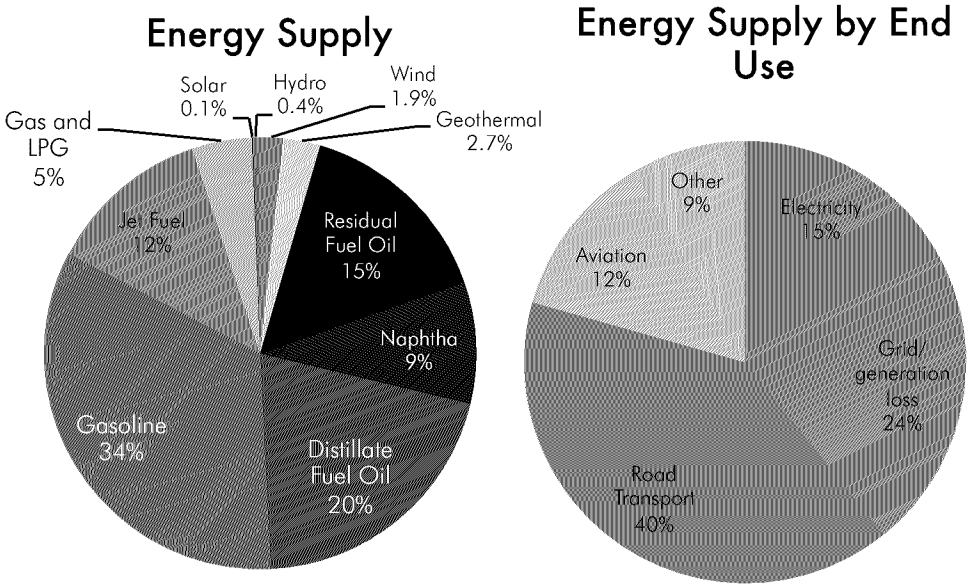

FIGURE 12. HAWAI'I ISLAND ENERGY SUPPLY, 2010*

In 2010,† Hawai'i Island consumed about 26,899 terajoules (TJ)‡ of energy, mostly in the form of liquid, petroleum-derived fuels such as motor gasoline, distillate fuel oil (diesel), naphtha, residual fuel oil, aviation fuels, and liquefied

* Note: Grid/generation loss refers to energy losses during petroleum-based electricity generation and system-wide transmission and distribution losses. Calculations by The Kohala Center. See: Appendix F.

† Due to data collection and release schedules, 2010 is the most recent year that allows for a reliable analysis of the entire island's energy system. In some cases 2011 data can be reported, but in general, the most recent data that is available is presented in this document.

‡ One terajoule is equal to 1 trillion joules, or about 948 million Btu (British thermal unit). This is approximately equal to the energy content of 163 barrels of crude oil or the electricity required to light a 13-Watt compact fluorescent light bulb for 2,439 years.

petroleum gas (LPG).* Just 5% of the energy needs of Hawai'i Island's residents, businesses, and visitors are met through locally produced renewable energy sources.

Hawai'i Island does have abundant renewable energy resources, such as solar, wind, geothermal, and bioenergy; however, the current energy system makes comparatively little use of these local supplies. Only about 1,369 TJ of the island's energy supply consists of electricity produced from geothermal, wind, solar, and hydropower resources. Hawai'i Island's overwhelming dependence on petroleum products is the fundamental reason for pursuing energy sustainability.

Hawai'i Island has no fossil fuel resources, so almost every barrel of petroleum that makes up the remaining 95% of the energy supply is imported into the state from international sources far from the islands (Figure 13). Most of the petroleum products consumed in the State of Hawai'i are refined locally at the two refineries on O'ahu, owned and operated by Chevron and Tesoro. Direct imports of refined products account for less than 10% of total fuel imported into the state, by volume.[1]

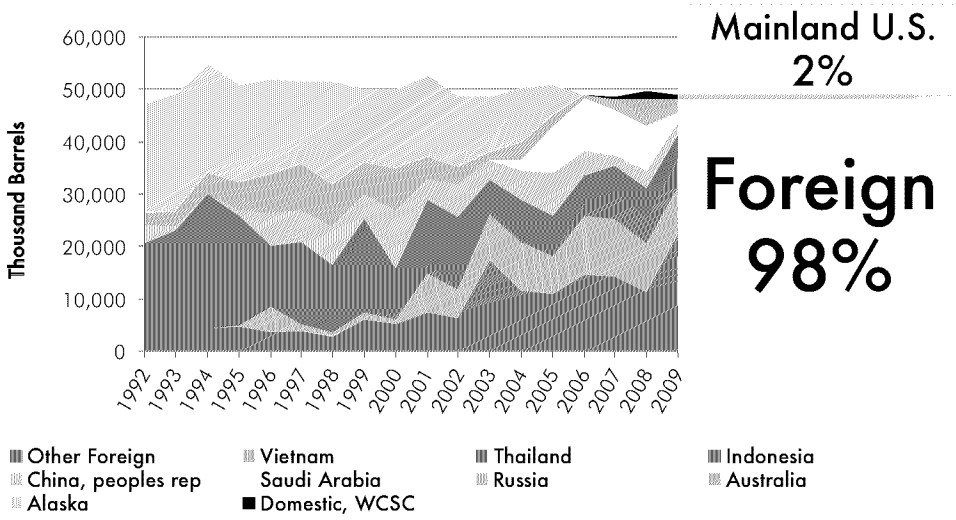

FIGURE 13. ORIGIN OF OIL IMPORTS INTO THE STATE OF HAWAI'I, 1992-2009†[1,17]

While the rest of the United States is similarly reliant on fossil fuels, the mainland's energy supply is more diversified to include lower cost coal and natural gas. Additionally, the mainland has significant domestic energy resources that supply 55% of the petroleum demand, 95% of the natural gas and nearly 100% of the

* Note: Assumes gasoline to be composed of 10% ethanol (by volume), and using a direct equivalent for the renewable sources of electricity. Calculations by The Kohala Center. See: Appendix F

† There are significant discrepancies among fuel import data sources, making island specific analysis unreliable in some cases

coal.[18] Hawai'i Island is exceptional for being almost completely dependent on exclusively on petroleum products from foreign sources. Petroleum prices also have significant impacts on the tourism industry (in the form of aviation fuel prices), which is a major component of the island's economy.

Motor gasoline, aviation fuels, and about one-quarter of the diesel consumed on the island were used in the transportation sector, accounting for 52% of the island's total energy supply. All of the residual fuel oil, naphtha, and about half of the distillate fuel oil consumed on the island (34% of the energy supply) are burned in power plants to generate electricity. These fuels are supplemented with electricity produced directly from renewable sources (5% of the energy supply), but the majority of the energy content of the fuels burned in power plants is lost during electricity generation, transmission, and distribution. The remaining 9% of the total energy supply was diesel for off-highway uses and liquefied petroleum gas (propane and synthetic natural gas) for heating, cooking, and industrial uses.

Figure 14 depicts the flow of energy from supply to demand for Hawai'i Island. On the left are the energy supplies (all quantities in terajoules). These energy supplies are delivered to the energy system, where some are converted from one form into another, and are eventually consumed by end users, which is shown on the right side of the figure. Table 2 shows the same information in tabular format. The top third of the table shows energy production and imports. The middle third indicates where energy is converted from one form into another (for example, from residual fuel oil into electricity), and the bottom third shows how energy is consumed by end-users.

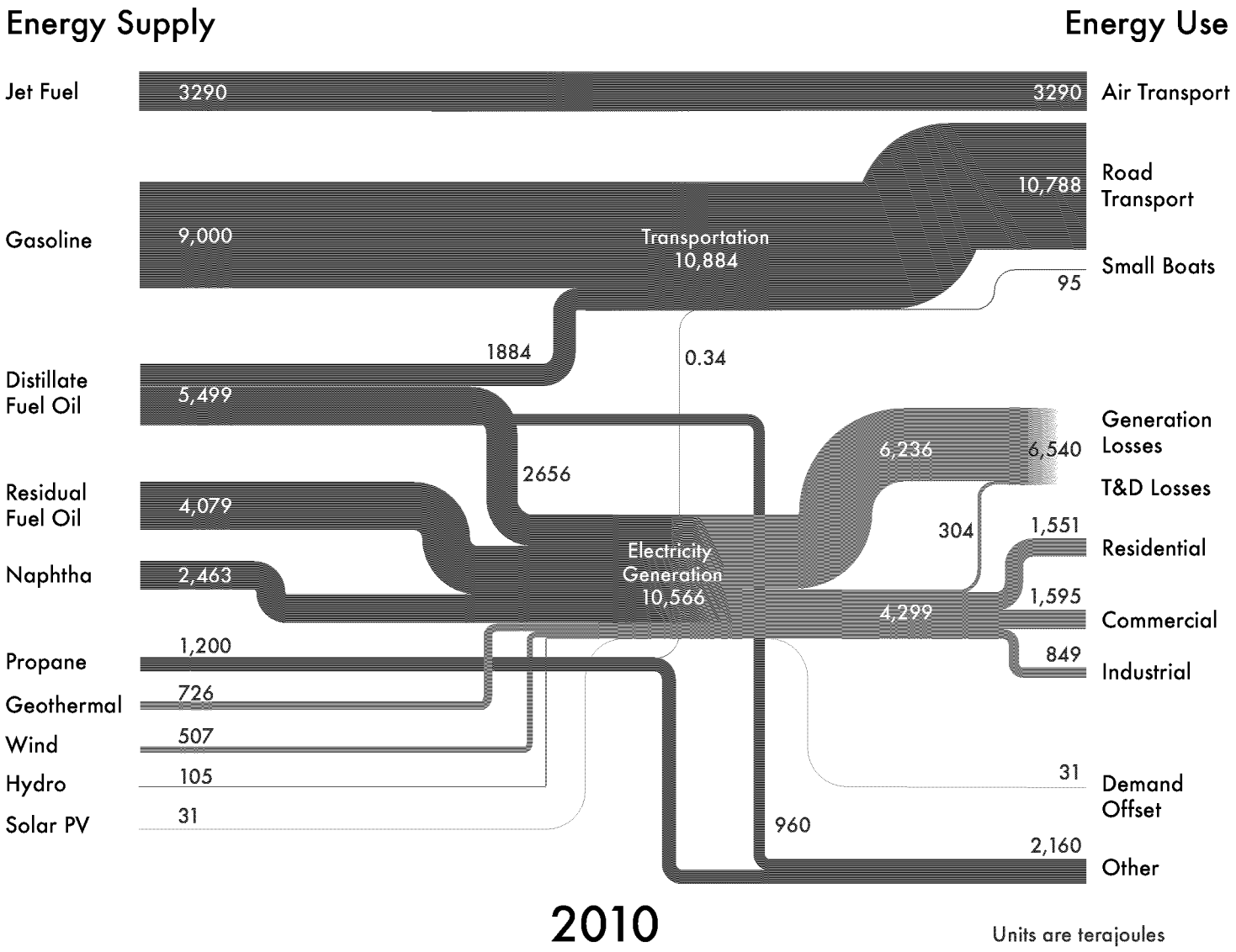

FIGURE 14. ENERGY FLOWS, COUNTY OF HAWAI'I, 2010

	(Units are terajoules)	Petroleum products							Renewable generation				Electricity	Total
		Residual Fuel Oil	Naphtha	Gasoline	Distillate Fuel Oil	LPG	Jet Fuel	Gas	Solar	Hydro	Wind	Geothermal		
Supply	Production	-	-	-	-	-	-	-	30.6	105	507	726	1,369	
	Imports	4,079	2,462	9,000	5,499	0.7	3,290	1,200	-	-	-	-	-	**25,530**
	Exports	-	-	-	-	-	-	-	-	-	-	-	-	
	Stock change	-	-	-	-	-	-	-	-	-	-	-	-	
	Total Energy Supply	**4,079**	**2,462**	**9,000**	**5,499**	**0.7**	**3,290**	**1,200**	**30.6**	**105**	**507**	**726**	**1,369**	**26,899**
Transformation	Electricity plant transformation	4,079	2,462	-	2,656	-	-	-	-	-	-	-	-	**9,197**
	Generation losses	3,084	1,436	-	1,717	-	-	-	-	-	-	-	-	**6,236**
	Net electricity generation	995	1,026	-	939	-	-	-	30.6	105	507	726	4330	
	Transmission and distribution losses												304	
Consumption	Electricity consumption	-	-	-	-	-	-	-	-	-	-	-	3,995	**3,995**
	Road transport	-	-	8,969	1,819	0.7	-	-	-	-	-	-	-	**10,788**
	Off-highway	-	-	-	960	-	-	-	-	-	-	-	-	**960**
	Small boats	-	-	31	65	-	-	-	-	-	-	-	-	**96**
	Aviation fuels	-	-	-	-	-	3,290	-	-	-	-	-	-	**3,290**
	Other	-	-	-	-	-	-	1,200	-	-	-	-	-	**1,200**
	Total final energy use			**9,000**	**2,844**	**0.7**	**3,290**	**1,200**					**3,995**	**20,328**

TABLE 2. ENERGY BALANCE, COUNTY OF HAWAI'I, 2010

Energy Prices and Expenditures

Petroleum dependence comes at a high cost. In 2011, the island's residents, visitors, businesses, and government spend more than $920 million on energy purchases, with electricity and transportation each accounting for about half of the total (Figure 15). Over the past six years, electricity prices have risen by over 40%, while consumption has remained flat. Over the same period, motor gasoline prices have increased over 48% and diesel prices have increased 58%.[2]

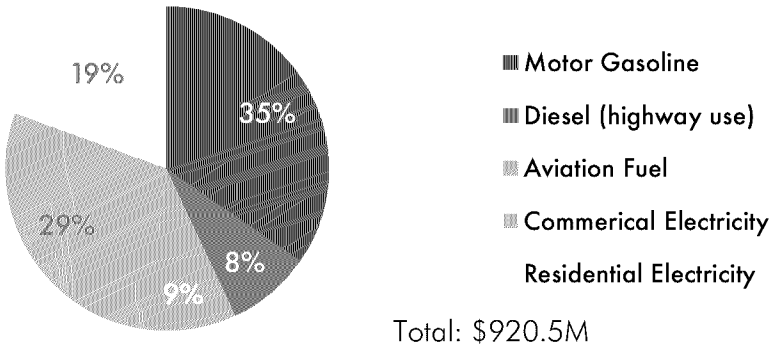

Figure 15. Energy Expenditures by Type, Hawai'i Island, 2011*

Hawai'i Island electricity prices are 35% higher than those on O'ahu, and exceed the mainland average by more than 300% (Figure 16). Motor gasoline prices are 25% higher than the mainland average while diesel prices are 28% higher.

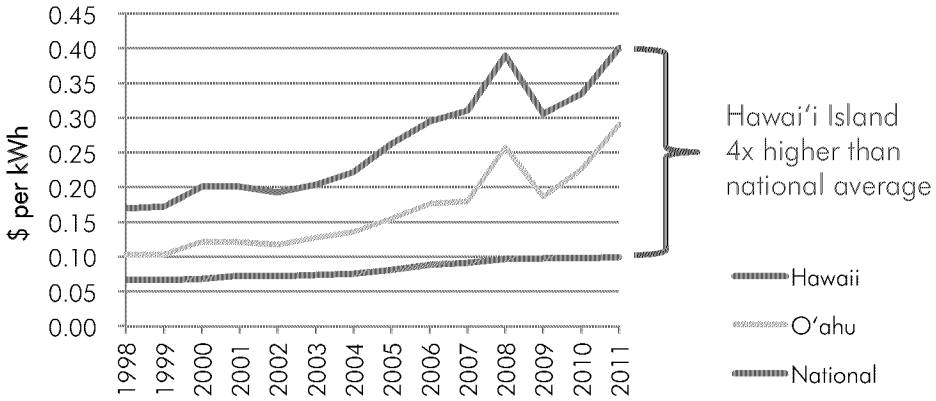

Figure 16. Electricity Prices: Hawai'i Island, O'ahu, and United States Average, 1998-2011[2,4]

* Notes: Includes taxes. Aviation fuels use West Coast average prices, which understate the true cost in Hawai'i (local data is withheld for competitive reasons). See: Appendix F.

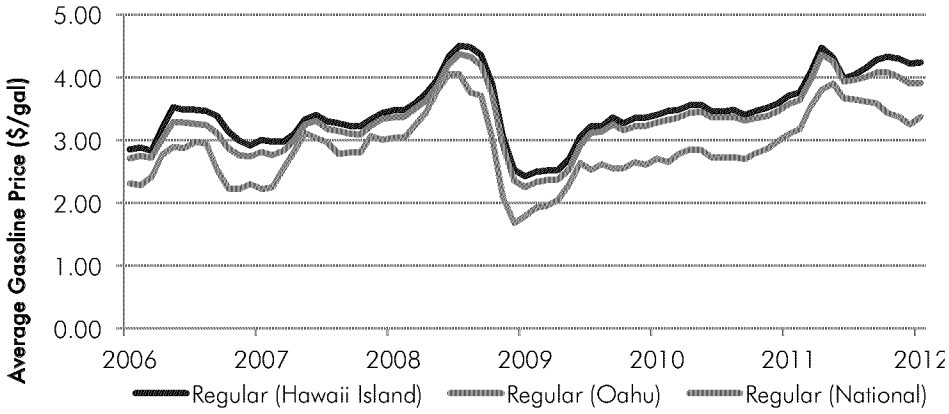

FIGURE 17. AVERAGE PRICE OF MOTOR GASOLINE, 2006-2012[2]

EQUITY IN ENERGY EXPENDITURES

Energy-related expenditures are a particular burden on low-income households because they cannot easily reduce consumption in the face of rising prices. Consequently, low-income households tend to spend a higher percentage of their income on energy than other households.

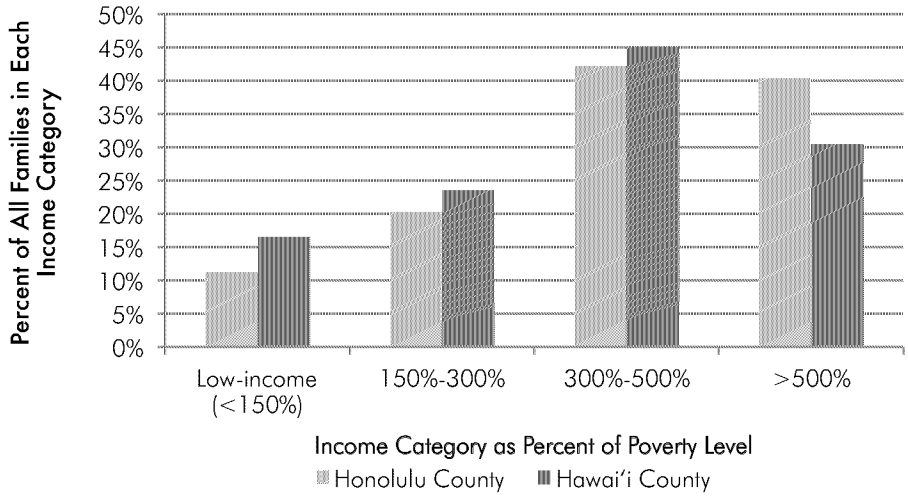

FIGURE 18. DISTRIBUTION OF FAMILIES BY INCOME, 2010[5]

This situation is more extreme on Hawai'i Island due to the island's high unemployment rate and high percentage of low-income families. One out of every six families (17%) on Hawai'i Island is classified as low-income, compared to just 11% on O'ahu (low-income families are defined as those at or below 150% of the federal poverty level).* Furthermore, the median household income on Hawai'i

* Classified as being at or below 150% of the federal poverty level for the state as determined by the Department of Health and Human Services. For example, a four-member household making

Island is 27% lower than on O'ahu.[5] On Hawai'i Island, low-income families spend more than twice as much of their income on electricity than the average island family.

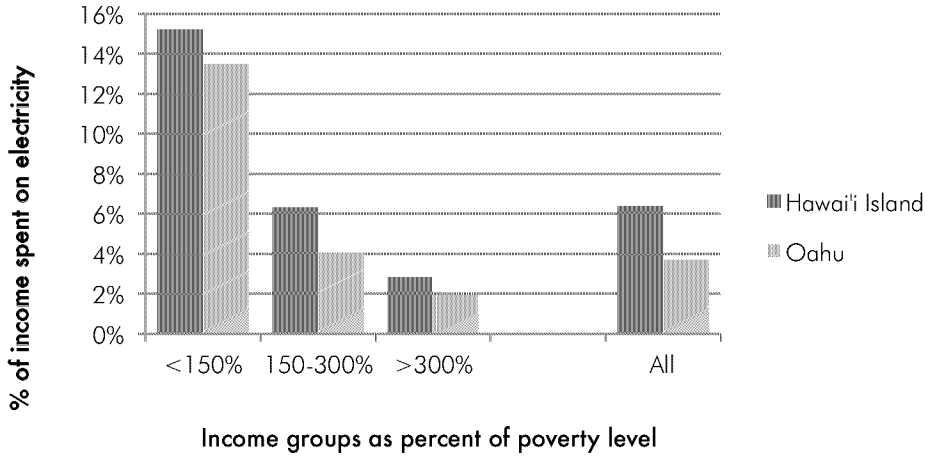

FIGURE 19. HOUSEHOLD ELECTRICITY EXPENDITURES BY INCOME GROUP, 2009[5]

Disparities in energy expenditures are exacerbated because many of the available cost-saving energy technologies, including those for renewable electricity, energy efficiency, and renewable transportation, are not as affordable to low-income households. For example, a solar PV system may be able to save a household many times the initial cost over its lifetime, but that initial cost could put it out of reach for many residents of the island. In addition, low-income residents often rent their homes, and building owners can be reluctant to purchase energy improvements if the benefits mostly accrue to the tenants.

Another important consideration related to equity is the recent change to electric rate structures approved by the Hawai'i Public Utilities Commission known as "decoupling." This policy has the effect of putting upward pressure on electric rates as total electricity consumption goes down. The intent is to remove the electric utility's financial incentive to discourage energy efficiency improvements and customer-sited renewable electricity generation (both of which have the effect of reducing utility sales). Revenue decoupling allows the utility to maintain constant revenues even as customers install renewable technologies and efficiency improvements that reduce their overall electricity purchases from the utility (for additional discussion of this policy, see "Major PUC Dockets", below).

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less than $ 25,360 is considered to be "in poverty"; at $38,040, the household would be considered "low-income."

However, if only wealthier customers are able install solar panels and otherwise reduce electricity purchases, the burden of rising rates (exacerbated under decoupling) will fall disproportionately on low-income customers. Since the utility is permitted to continue to impose limits on the amount of customer-sited or variable generation the system can accommodate, early adopters enjoy cost benefits that may not be available to all utility customers going forward. These limits have already been reached for many parts of Hawai'i Island.

For transportation, equity issues are difficult to quantify with currently available data, however the combination of Hawai'i Island's low population density and high gasoline prices could increase the financial burden of commuting as compared to the other islands in the state. Accessing affordable transportation is potentially more difficult for low-income residents, particularly if available jobs are distant from affordable housing. The annual gasoline expenditures per licensed driver in 2010 were substantially higher on Hawai'i Island than the state and national averages (Figure 20).

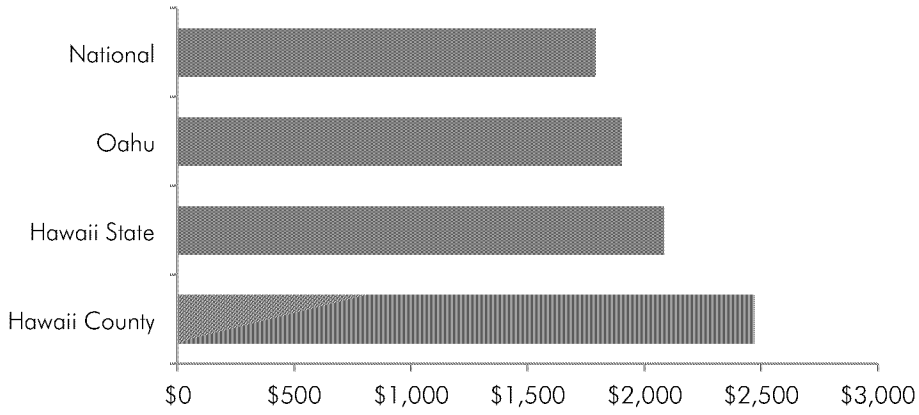

FIGURE 20. GASOLINE EXPENDITURES PER LICENSED DRIVER, 2010[7,19]

The only major alternatives to personal vehicle transportation available to Hawai'i Island residents are the public mass transit system and informal carpooling. Only 1.7% of workers report using the mass transit system to get to work, [9] suggesting that system does not serve the needs of current commuters. Hawai'i Island does however have a somewhat higher percentage of workers carpooling than the other counties and a significantly higher percentage than the national carpooling rate (16% vs. 10%).[9]

Transportation Sector

Overview

Despite accounting for over half of Hawai'i Island's energy demand, transportation (ground and aviation) is not well represented in the major public energy policy and decision-making processes at the state- or county-level. The challenge of achieving transportation energy sustainability is magnified by the fact that the technologies for renewable energy in transportation have been slower to come to market than renewable technologies for electricity.

In 2010, Hawai'i Island consumed more than 14,000 TJ of energy for transportation. Of the more than 100 million gallons of transportation fuel consumed on the island every year, nearly 80% of that is gasoline. The island consumes more than 200,000 gallons of gasoline every day. [2]

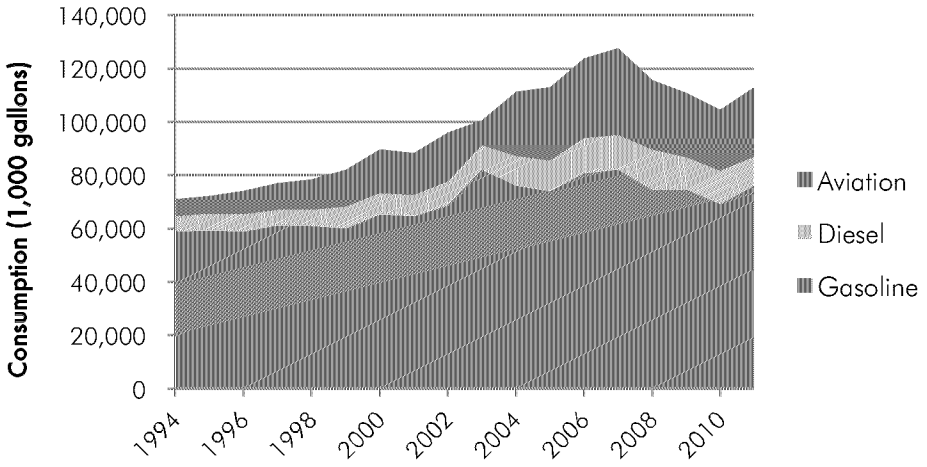

Figure 21. Transportation Fuel Consumption, Hawai'i County, 1994-2010[6]

At 4,028 square miles, Hawai'i Island is by far the largest island in the state, almost twice as large as all other islands combined. [8] Most of the island's major communities are spread around the perimeter of the island, which necessitates an extensive transportation infrastructure. Hawai'i Island's transportation system includes 1,481 miles of public roadways, of which 946 miles (64%) are County owned, plus two airports with scheduled commercial service, [8] and a mass transit system administered by the County of Hawai'i.

Ground Transportation

There are about 172,000 vehicles registered on Hawai'i Island, though there are only 129,000 licensed drivers, so the island's vehicle stock exceeds the number of drivers by 33%.[8] This is higher than the average ratio of vehicles to licensed drivers for the US by more than 23,000 vehicles.[7] Passenger vehicles vastly outnumber other vehicle types (passenger vehicles include light trucks and vans up to 6,500 pounds). Less than 1% of registered vehicles are hybrid or electric. Vehicle registrations have risen sharply over the last year. Since January 2011, more than 10,000 additional gasoline passenger vehicles were registered, compared to just 600 additional hybrid or electric vehicles.[2]

Table 3. Registered Vehicles, Hawai'i County, by Type, 2010[2]

Vehicle Type	Number	Percent
Passenger vehicles	130,102	75.7%
Trucks	36,932	21.5%
Motorcycles, motorscooters	4,369	2.5%
Other	571	0.3%

The island's mobility demand, as measured by vehicle-miles traveled, is an estimated 1.6 billion vehicle-miles in 2010.[8] On average, the island's current vehicle stock achieves less than 17 miles/gallon, the worst vehicle efficiency performance in the state (Figure 22), which has been attributed to the island's rugged terrain and high proportion of light-duty trucks in the vehicle stock. The vehicle stock also has a low turnover (>25 years), meaning that much of the existing inefficient vehicle stock is likely to persist for decades to come.*

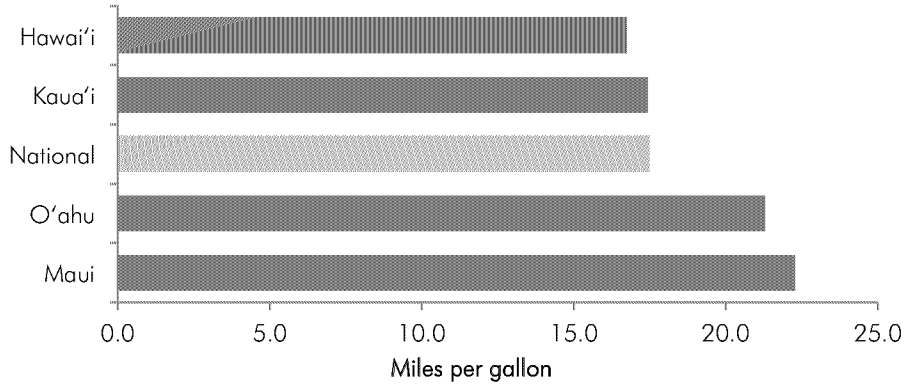

Figure 22. Fuel Economy, by Island, and National Average, 2010[7,8]

* Vehicle turnover rate indicates the relationship between the size of the existing vehicle stock (172,000 vehicles) and the number of new vehicles sold each year (new vehicle sales in the last 5 years have ranged between 7,000 and 3,400 per year). See: Appendix F.

Both highway fuel consumption and vehicle miles traveled have more than doubled since the mid-1980s, before leveling off since 2006. Vehicle miles traveled per registered vehicle has held steady since 1984, but have fallen recently to 9,729 miles/vehicle in 2010, the lowest level in the last 25 years.[8]

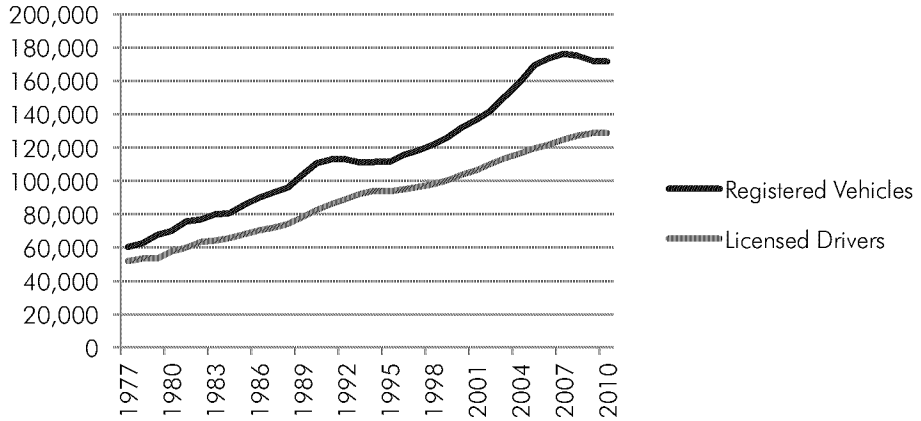

FIGURE 23. REGISTERED MOTOR VEHICLES AND LICENSED DRIVERS, HAWAI'I COUNTY, 1977-2009[8]

PRIVATE PASSENGER CARRIERS AND RENTAL CARS

There are 212 passenger carrier companies on Hawai'i Island, comprising 1,047 vehicles with a combined seating capacity of 23,338 passengers. There are 1,289 property carriers (primarily moving companies and truckers) with a combined fleet of 5,052 vehicles.[8] In 2010, 197 taxicabs were registered with in the county. In 2007, the most recent year for which data is available, there were 25 car rental establishments that generated $103 million in revenue.[8] Data on the number of rental cars serving the island is not publicly available.

MASS TRANSIT SYSTEM

The mass transit fleet includes 51 vehicles ranging in size from 14-passenger vans to 89-passenger double-decker buses.[20] The mass transit fleet covers 11 routes, logged 57,810 hours on the road, and traversed 1.7 million miles in 2010.[20] The system provided nearly 1.15 million passenger trips.[21]

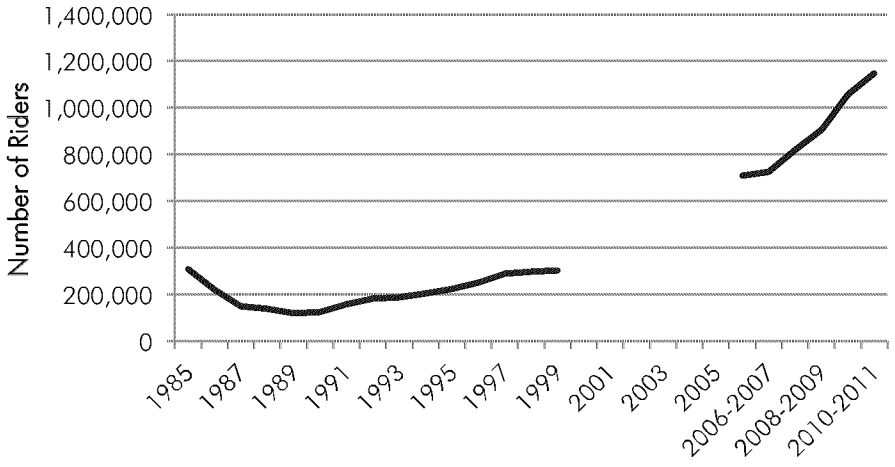

FIGURE 24. MASS TRANSIT RIDERSHIP, HAWAI'I COUNTY[22,23]

Ridership on the County mass transit system has grown rapidly from 2005 through 2010, increasing 61% over that time period, while population only grew 7.4% (Figure 24). However, the vast majority of island residents do not utilize the mass transit system. A survey conducted in 2009 by the Hawai'i Energy Policy Forum found that just 4.9% of Hawai'i County respondents had used the mass transit system in the week before the survey was conducted, the lowest use rate of any county in the state.[24] Another survey conducted by the US Census Bureau found that only 1.7% of commuters utilize the mass transit system.[9]

The Mass Transit Agency does not have a recent strategic plan or other planning document available for review; however, an analysis of the routes and trip frequency (Table 4) suggests the system is designed at least in part to serve three major functions:

- Transporting passengers from Hilo and Ka'u to the resorts in South Kohala (departures on these routes are heavily concentrated between 3:30am and 6:00am)
- Transporting passengers from Puna to Hilo (route is second in both hours and miles traveled, with a more convenient trip schedule staggered throughout the day)
- Intra-Hilo and –Kona routes (the two most urbanized locations)

One important consideration is that the current design does not allow for convenient access to other transportation hubs. For example, only 3 individual buses (trips, not routes) serve the Kona airport, and one of those seems to originate there but never returns.

TABLE 4. MASS TRANSIT SERVICE, COUNTY OF HAWAI'I[20]

Route	Hours	Miles Traveled	Freq. (M-S)	Freq. (Sunday)	First Bus	Last Bus
Hilo-South Kohala	11,742	558,450	8	8	3:30am	7:30pm
South Kohala - Hilo			7	8	7:10am	11:10pm
Honokaa - Hilo	1,369	54,000	12	10	12:15am	5:35pm
Hilo - Honokaa			11	8	3:30am	7:30pm
Intra Hilo	6,429	151,500				
Kohala - Kona	1,993	48,000	1	-	6:45am	6:45am
Kona - Kohala			1	-	1:35pm	1:35pm
Kohala - South Kohala	798	24,000	1	-	6:20am	6:20am
South Kohala - Kohala			1	-	4:15pm	4:15pm
Intra Kona (north)	6,174	90,000	8	1	5:05am	4:05pm
Intra Kona (southbound)			8	1	6:25am	4:20pm
Kona - Hilo	5,277	138,000	3	-	6:30am	4:00pm
Hilo - Kona			3	-	3:50am	1:30pm
Pahoa - Hilo	8,628	230,880	11	-	6:10am	3:30pm
Hilo - Pahoa			10	-	7:30am	9:00pm
(Ka'u) Volcano - Hilo	2,976	90,000	3	-	6:10am	5:50pm
Hilo - Volcano (Ka'u)			3	-	5:00am	4:40pm
Ka'u - South Kohala	6,349	219,600	3	1	3:30am	8:00am
South Kohala - Ka'u			3	1	7:15am	4:50pm
Intra Waimea	4,725	82,500	11	-	6:30am	4:30pm
Intra Waimea (return)			11	-	7:00am	5:00pm
Waimea - Hilo	1,350	30,000	10	7	7:45am	11:55pm
Hilo - Waimea			10	9	3:30am	7:30pm

Aviation Fuel Consumption

Between 1994 and 2007, there was a significant increase in aviation fuel consumption on the island (Figure 25). After the economic recession beginning in 2008, aviation fuel consumption dropped as the number of visitors declined.

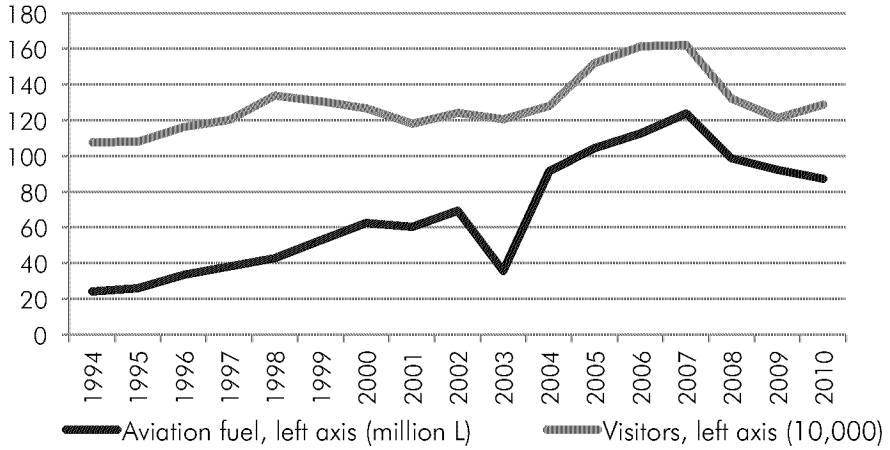

Figure 25. Aviation fuel consumption, visitors, Hawai'i Island, 1994-2010[6,8]

Government Transportation Policy

Energy policy for the transportation sector does not receive the same attention as for electricity even though over half of the island's energy supply is devoted to ground transportation and aviation. The transportation sector is not subject to the same level of regulation as the electricity sector. Furthermore, transportation decision-making is more decentralized and subject to thousands of individual preferences, which can be both a blessing and a challenge to achieving energy sustainability for the island.

Despite having less direct government regulation, the government does play a dominant role in transportation policy due to the island's reliance on significant annual investment activities by both the state and the county government to maintain and improve the island's transportation infrastructure. Other major policy decisions include planning and permitting of land use broadly, as development patterns lock in transportation patterns for decades. At the state-level, the Department of Transportation develops long-term island-wide transportation plans and administers federal grant funding for local road construction and maintenance. The County of Hawai'i owns about 64% of the island's public roadways and develops and administers its own transportation system policies.[22] The key County-level agencies responsible for transportation policy are the Department of Public Works (DPW), the Department of Planning, and the Mass Transit Agency.

State-level Transportation Policy

The Hawai'i State Plan, codified in state law under Hawai'i Revised Statutes §226, establishes long-term goals and objectives for development in the state. The state's transportation policy goals are described in HRS §226-17, which states in part, that transportation planning in the state be directed to achieve:

> *"An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods."*

The state's energy policy is far-reaching and includes a provision directly related to transportation energy (HRS §226-18):

> *"To further achieve the [State's] energy objectives, it shall be the policy of this State to...promote alternative fuels and energy efficiency by encouraging diversification of transportation modes and infrastructure...."*

The Alternate Fuel Standard, codified in Hawai'i Revised Statutes §196-42, sets a goal of 30% of highway fuels from alternative sources by 2030. The law sets a goal but does assign responsibilities for implementation or establish penalties for noncompliance. In addition, the statutory definition of alternative fuels includes natural gas and liquefied petroleum gas, which are not renewable resources.

Hawai'i Clean Energy Initiative

The state's commitments under the Hawai'i Clean Energy Initiative (HCEI) also establish state energy objectives. The overall goal the HCEI is to achieve 70% renewable energy in Hawai'i by 2030.[25] This goal translates to reducing transportation fuel use statewide by an estimated 385 million gallons per year. Most of the work completed under HCEI so far has focused on renewable electricity generation and energy efficiency in the end-use electricity sector. If funding for HCEI programs continues to be made available from the US DOE, transportation programs could be given more resources.

The State Energy Office, part of the state Department of Business, Economic Development, and Tourism (DBEDT), administers programs and coordinates activities under the Hawai'i Clean Energy Initiative, and also supports several transportation related programs. One of the largest state-level transportation energy focused programs is a $4.5 million grant from the US Department of Energy called the Hawaii EV Ready Program administered by the State Energy Office. The program funding was exhausted in May 2012.[26]

According the DBEDT's Hawaii EV Charging Station Database,[26] as of March 29, 2012, there are 26 public EV charging stations at seven sites on Hawai'i Island with and additional location with two chargers expected by June 30, 2012. Only one charging site is planned for the east side of the island.

Department of Transportation

The Department of Transportation (DOT) oversees the state's major airports, develops long-range transportation plans for the state's transportation infrastructure, and administers many government funded transportation improvement projects.

The DOT is currently in the process of updating the Hawai'i Island Long-range Land Transportation Plan (anticipated completion in 2012) and the Hawai'i Statewide Transportation Plan.* The Statewide Transportation Plan describes broad goals and objectives that are intended to guide other transportation planning efforts. The DOT encourages local transportation plans to be consistent with the Statewide Plan.

Both federal and state law require the Statewide Plan to consider more than simply road transportation infrastructure. Federal law requires the Plan "be inter-modal" and includes a separate "plan for bicycle transportation, pedestrian walkways, and trails".[27] State law (HRS §279A) requires a component for surface mass transit systems. Despite these requirements, in practice the planning efforts in the past have focused mainly on roadway improvements, leaving mass transit and alternative fuels to the counties or other state-level departments.

In addition to its planning role, the DOT administers a substantial pool of state and federal funds for transportation system improvements throughout the state. DOT programs focus on highways, airports, and harbors. DOT reported expenditures of $420 million on highways alone in fiscal year 2010, with at least $22.7 million going to Hawai'i island highway operation and maintenance.†[28]

County of Hawai'i Transportation Policy

At the County level, three separate agencies have significant transportation system responsibilities. The Department of Public Works manages construction and maintenance of major public roadways; the Mass Transit Agency administers public mass transit programs; and the Department of Planning oversees long-range planning for the island, administers zoning and subdivision regulations, and advises the Planning Commission, the Mayor, and the County Council on land use and development.

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* The Statewide Transportation Plan was last revised in 2002. The current Hawai'i Island plan was written in 1998.

† Department of Transportation, Highways Division financial data is not reported by project or service location, with the exception of the $22.7 million figure for highway operation and maintenance. This figure does not capture government grants or capital improvement projects implemented on Hawai'i Island.

County Transportation Goals

The County of Hawai'i General Plan establishes policies to promote efficiency, safety, and a variety of public transportation options for the island. The General Plan acknowledges and emphasizes the importance of comprehensive and integrated planning of land use and transportation systems. Development and transportation are mutually reinforcing and in many ways dependent on each other. However, development of a comprehensive transportation plan for the island has not yet been started.

The County General Plan describes two broad energy-related goals (affecting both transportation and electricity policy):

- Strive towards energy self-sufficiency
- Establish the Big Island as a demonstration community for the development and use of natural energy resources

The General Plan also defines several transportation-specific goals:

- Provide a transportation system whereby people and goods can move efficiently, safely, comfortably and economically.
- Make available a variety of modes of transportation that best meets the needs of the County.
- Provide residents with a variety of public transportation systems that are affordable, efficient, accessible, safe, environmentally friendly, and reliable

The General Plan also includes a number of more specific polices to guide future transportation investments:

- Develop a comprehensive, island-wide multi-modal transportation plan that identifies the location and operation of automobile, mass transit, bicycle and pedestrian systems, in coordination with appropriate Federal and State agencies.
- Consider the development of alternative means of transportation, such as mass transit, bicycle and pedestrian systems, as a means to increase arterial capacity.
- Encourage the development of walkways, jogging, and bicycle paths within designated areas of the community.
- Explore means and opportunities to enhance the shared use of the island's road- ways by pedestrians and bicyclists, in coordination with appropriate government agencies and organizations.
- The Bikeway Plan for the County of Hawaii (1979) shall be updated to include the development of a safe and usable bikeway system throughout the island.

Vision 20/15: Green Government Action Plan

In addition to the goals described previously, the Vision 20/15 sets County objectives for its transportation fleet include, by 2015 based on a FY2007-2008 baseline, a 20% reduction in fuel consumption, a 20% increase in energy efficiency for both the county operations fleet and the mass transit system, as well as to acquire 20% of fuels for the fleet from renewable resources.

Other Goals

The Department of Public Works maintains an official goal to reduce island vehicle use by integrating "transit, vehicle, bicycle, and pedestrian modes of travel into a shared roadway."[21] However, it is unclear how this is goal is currently implemented or whether any employees track progress toward achieving it. None of the individual divisions of the Department list anything related to transit or alternative modes of travel in their program objectives for the current budget year.

The mission statement of the Department of Planning is to "foster an improved quality of life" for the island's communities and views transportation planning as part of its responsibilities.[21] The Department lists a program objective to start "transportation planning, bike and pedestrian planning, and Hawai'i roadway standards" in the 2011-2012 fiscal year budget.

County Transportation System Investments

Each year the County invests millions of dollars in the island's transportation system; $40.3 million in FY2010-2011 expenditures, or about 11% of all County expenditures (Figure 26). These investments indicate the *de facto* transportation policy of the County. Principal activities include construction and maintenance of highways and streets, maintenance of the island's traffic signals and other safety features, and funding of the mass transit system (about 16% of County transportation expenditures).

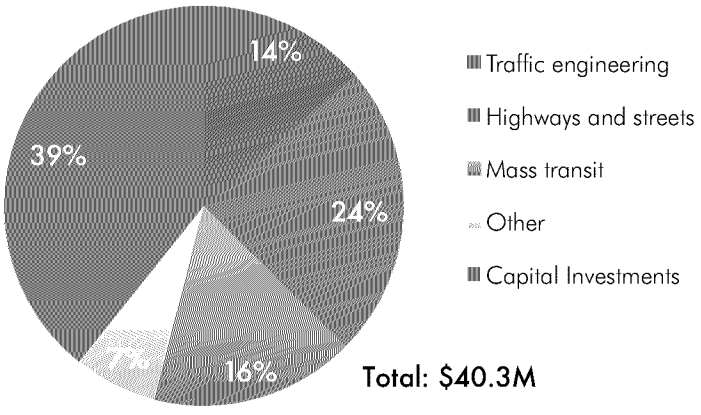

Figure 26. Transportation System Infrastructure Investments, County of Hawai'i, FY2010[23]

Some funding used to support County transportation system investments comes from the General Fund, but the majority (86%) comes from the Highway Fund and other sources such as Capital Improvement Program.* [23] In 2010, the County allocated $5.7 million from the General Fund to transportation investments. Almost the entire amount was distributed to the Mass Transit Agency. Use of the General Fund for transportation system investment was subsequently discontinued to free up General Fund resources for other County programs.

The Highway Fund is a separate County account that receives revenues from the motor vehicle weight tax, County taxes on liquid fuels, and public utilities franchise fees. State law prevents the County from diverting these revenue streams to other funds or uses.† However, Highway Fund revenues are not always exhausted each year. In 2010, expenditures from the Highway Fund totaled $19.5 million, but Highway Fund revenues topped $25.8 million. Even after $3.6 million was diverted into the Capital Projects Fund, the Highway Fund revenues had exceeded expenditures by $2.7 million, leaving a total unused balance of $13.3 million remaining in the Fund at year-end.[23]

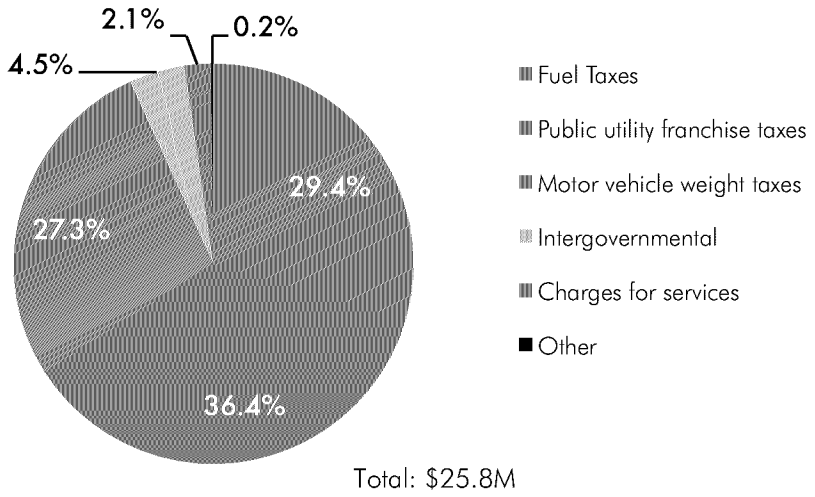

FIGURE 27. HIGHWAY FUND REVENUE SOURCES, COUNTY OF HAWAI'I, FY2010-2011 [23]

The Mass Transit Agency does not provide a detailed accounting of its activities. However, some indications of the sources and uses of funds are available from

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* Publicly available data does not precisely reveal the sources or uses of County investments in the transportation system. Figures reported by the Department of Finance were supplemented with County budget documents.

† HRS §§46-47, 243-6, and 249-18 provide that these taxes and fees must be allocated to the Highway Fund, and their use is further limited by to public roadway construction and maintenance, street lighting and traffic safety, mass transit, and bikeways (with the exception of public utility franchise fees, for which mass transit and bikeways are not permitted uses).

the County budget. In the 2011-2012 fiscal year, the County approved a Mass Transit Agency budget of $8 million, a 19% increase over 2010-2011 expenditures of $6.7 million. Based on a ridership of 1.14 million, the Mass Transit Agency provides service at an average cost of $5.80 per passenger-trip in 2010.[21]

Electric Power Sector

Overview

The island's electric power sector currently consumes about 10,369 TJ of energy each year (39% of total energy supply) in the form of residual fuel oil, naphtha, diesel fuel, and renewable sources. However, only about 4,026 TJ of this energy is delivered to customers as electricity, meaning about 62% of the energy consumed in the electricity sector is lost through inefficiencies in generation, transmission, and distribution.*

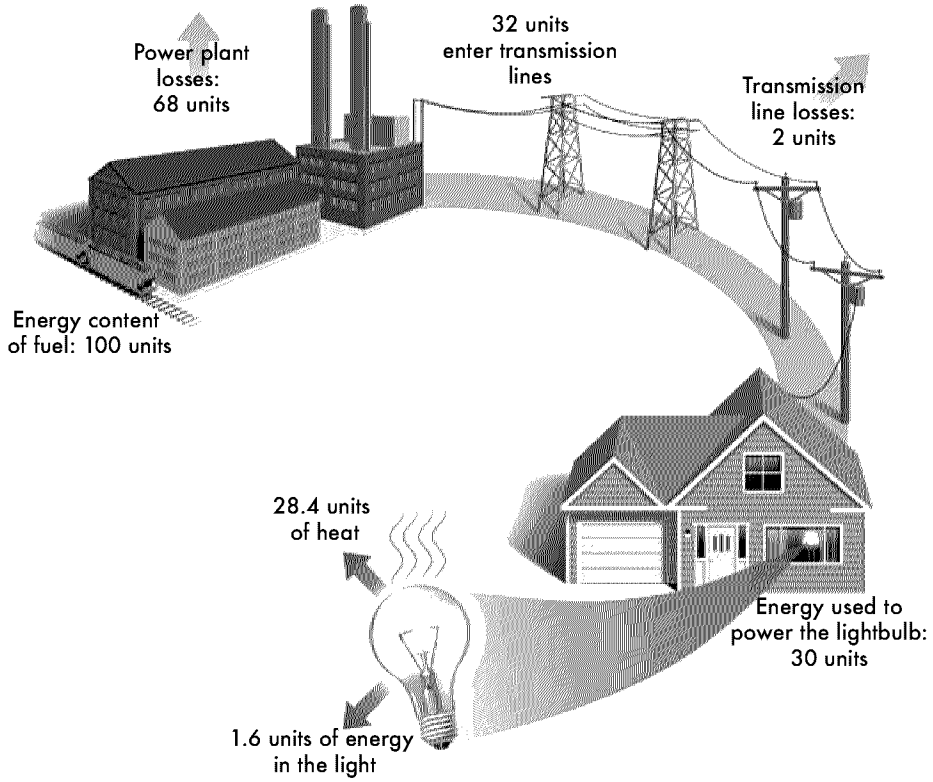

Figure 28. Illustration of Losses in the Electric Power System†[29]

* Calculations by The Kohala Center. See: Appendix F.

† Adapted for Hawai'i Island.

The island's electric power system is owned and operated by Hawaii Electric Light Co., Inc. (HELCO).* The State of Hawai'i grants HELCO a non-exclusive franchise for electric utility service, and the company operates as a monopoly regulated by the Public Utilities Commission. HELCO served 80,170 customers and delivered 1,194,000 megawatt-hours† (MWh) of electricity to the power system in 2010.[2] The electricity demand (load) on the system peaked at 190.6 megawatts (MW); the minimum recorded load was 85.1 MW.[10] About 46% (552,891 MWh) of the delivered electricity was generated by HELCO in company-owned facilities.[11] Between 2007 and 2010, electricity sales actually decreased by 1.3% per year, reversing the earlier trend (from 1994 to 2007 sales increased an average of 2.9% per year).[4]

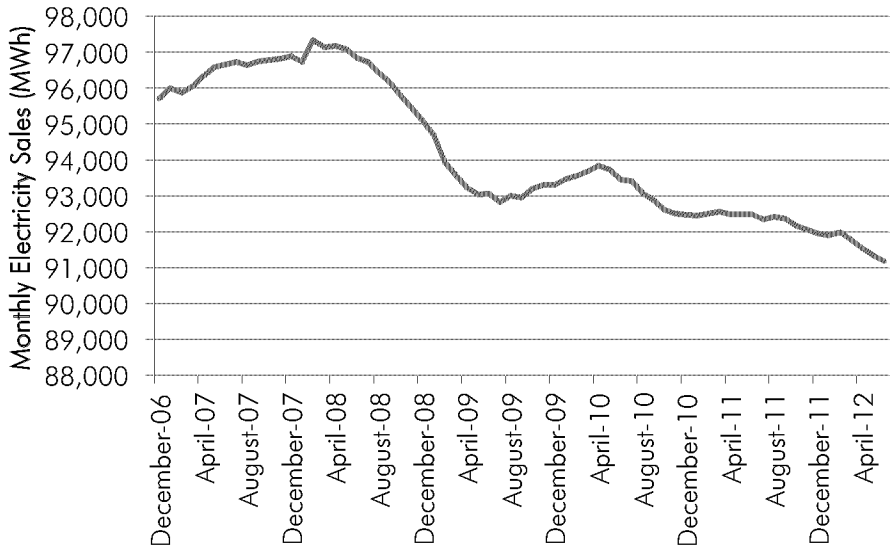

FIGURE 29. HELCO ELECTRICITY SALES (12 MONTH ROLLING AVG.)[2]

POWER GENERATION FACILITIES

There are 14 major generating facilities connected to the island's power system, most of which are owned and operated by HELCO.[11] Independent power producers include Hamakua Energy Partners, Puna Geothermal Venture, Hawi Renewable Development, Pakini Nui Wind Farm, and Wailuku River Hydroelectric. The HELCO-owned plants and the independent power producers have a total generating capacity of 343 MW, which includes 86 MW of renewable capacity.[11]

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* HELCO is a subsidiary of Hawaiian Electric Co. (HECO), which also owns the power systems on O'ahu, Maui, Moloka'i, and Lana'i. HECO itself is a unit of Hawaiian Electric Industries, Inc. (HEI), a company publicly traded on the New York Stock Exchange (symbol HE).

† One megawatt-hour is the energy provided by one megawatt of power for a duration of one hour. One megawatt is equal to 1 million watts.

There are also an estimated 1,650 rooftop solar photovoltaic systems connected to the grid with a capacity of an additional 10.2 MW (Figure 30).

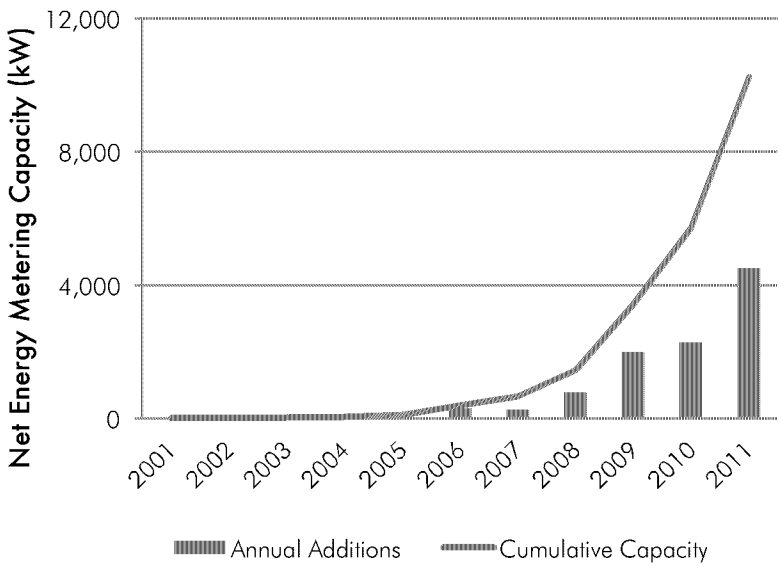

FIGURE 30. CUSTOMER-SITED RENEWABLE ELECTRICITY CAPACITY, HAWAI'I ISLAND, 2001-2011[30]

The largest source of renewable electricity on the island comes from Puna Geothermal Venture located near Pahoa. The facility has a capacity of 38 MW under contract to HELCO.* In 2010, the facility generated 200,500 MWh and accounted for about 17% of electricity generation.[11] Wind farms in Hawi and at Ka Lae (Pakini Nui Wind Farm) collectively contributed another 140,000 MWh (12% of generation). Hydropower units contributed 28,000 MWh. Solar power only generated an estimated 8,500 MWh (<1% of delivered electricity).†[31]

Renewable sources collectively provided about 37% of electricity generation on Hawai'i Island in 2011. Nationally, only about 13% of electricity generation is from renewable sources.[3] However, this only amounts to 5% of the island's total energy supply due to the large percentage of total supply that goes to transportation and the significant amount of energy lost in the electric power sector.

* In 2010, the Puna Geothermal Venture Plant had a capacity of 30MW before upgrades in 2011.

† Most solar photovoltaic systems are not individually metered by the utility. Solar electricity production is estimated using the reported net metering capacity and an average capacity factor estimated by HELCO to be 17%.[30]

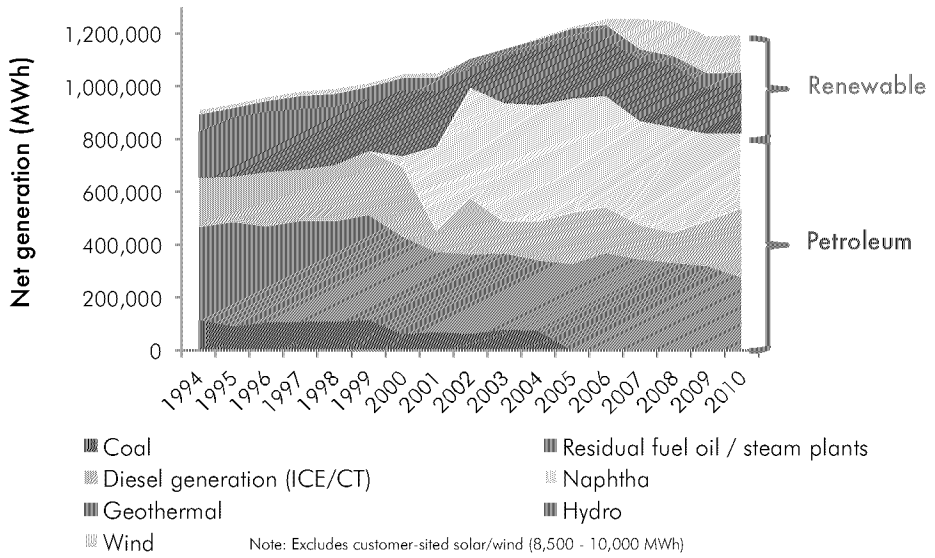

FIGURE 31. NET ELECTRICITY GENERATION BY SOURCE, 1994 – 2010[11]

ELECTRICITY POLICY AND REGULATION

The policy and regulatory structure affecting Hawai'i Island's electric power sector is extraordinarily complex with influences from the federal, state, and county governments. Energy is a vital part of the state's economy, so the Hawai'i State Legislature has established a significant state-level presence in the energy industry, particularly in electricity.

Electricity policy is primarily determined by requirements of Hawai'i state law and through decisions of the Hawai'i Public Utilities Commission. In addition, the Governor of Hawai'i has wide latitude to utilize the state government to pursue energy-related objectives. The Department of Business, Economic Development, and Tourism (which houses the State Energy Office) is the primary agency of the executive branch responsible for the administration's energy goals. Local laws have a less direct influence, primarily through building codes, permit approval processes, and land-use decisions.

Electricity policy and regulation is primarily determined at the state level, through laws of the State of Hawai'i and decisions of the Hawai'i Public Utilities Commission.

The State Legislature created the Hawai'i Public Utilities Commission to oversee most government regulation of the electric utilities and the provision of electricity services throughout the state. The legislature has also passed laws suggesting its priorities for regulation, and has in some cases intervened into the regulatory environment directly. These laws set broad energy policy for the state and bind the State and County governments (including the Public Utilities Commission) as well as private stakeholders.

State Energy Policy Objectives

At the broadest level, the state's energy goals are codified in statute under Hawai'i Revised Statutes §226-18, which states in part, that energy planning shall be directed to achieve:

- dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;
- increased energy self-sufficiency where the ratio of indigenous to imported energy use is increased;
- greater energy security and diversification in the face of threats to Hawai'i's energy supplies and systems; and
- reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use.

The law also states that state energy policy decisions shall:

- base energy resource decisions on a comprehensive, quantitative and qualitative comparison of supply- and demand-side options by total costs and benefits, including economic, environmental, social, cultural, and public health; and
- ensure that any new supply-side resources use the least-cost supply option.*

County-Level Policies

The County is responsible for implementing the County of Hawai'i General Plan, which lays out principles and standards designed "to assure the coordinated development of the county and to promote the general welfare and prosperity of its people", including "the general location and extent of public utilities."[32] Thus, the General Plan is a critical component of energy policy for the Hawai'i Island. The County Council must adopt a General Plan through ordinance. The most recent version of the General Plan was completed in 2005.

The County General Plan describes two broad energy-related goals (affecting both transportation and electricity policy):

- Strive towards energy self-sufficiency
- Establish the Big Island as a demonstration community for the development and use of natural energy resources

The General Plan also defines several public utility related goals:

- Ensure that properly regulated, adequate, efficient and dependable public and private utility services are available to users
- Maximize efficiency and economy in the provision of public utility services
- Design public utility facilities to fit into their surroundings or be concealed from public view

* For additional discussion see Major Energy Laws, below.

Vision 20/15: Green Government Action Plan

As part of the Vision 20/15 Green Government Action Plan, Mayor Kenoi has established goals for the County administration in the areas of electricity and transportation, streetlights, and water delivery, wastewater, and solid waste services. The County administration also has goals related to social and economic development that are relevant to the energy policy landscape on the Island.

The County has committed to achieve a 20% reduction in fossil fuel use, a 20% reduction in electricity and fuel expenditures, and a 20% reduction in greenhouse gas emissions from the FY2007-2008 baseline by 2015. This is intended to be accomplished through improved energy efficiency and increased renewable energy procurement for county facilities and the transportation fleet.

Table 5. County of Hawai'i Vision 20/15 Goals

Area of Operations	County Goal
Electricity	Reduce consumption to 6.91 kWh/ft^2. Acquire 50% of electricity from renewable sources.
Transportation (county vehicles and mass transit)	Reduce fuel consumption by 20% and increase fuel efficiency by 20%. Acquire 20% of fuels from renewable sources.
Streetlights	Reduce energy use by 20% to 3.12 million kWh.
Water	Reduce un-metered water loss to 15%. Increase on-site renewables by 10%.
Wastewater	Increase on-site renewables by 10%.
Solid Waste	Increase recycling and waste diversion to 50%.

Major Energy Laws

The Hawai'i State Legislature has passed several energy-related laws that set guidelines and affect decision-making of other energy stakeholders, including the Public Utilities Commission, the electric utilities, and individuals.

Table 6. Summary of Major Energy Laws, State of Hawai'i

State Law	Authority	Summary
State Energy Goals	Hawai'i Revised Statutes (HRS) §226-18	The statute requires that energy planning shall be directed to achieve dependable, efficient, and economical energy systems; increased energy self-sufficiency; greater energy security; and reduction of greenhouse gas emissions. Also, all energy policy decisions must be based on a comprehensive comparison of supply- and demand-side options, including economic, environmental, social, cultural, and public health costs and benefits; and any new supply-side resources developed must use the least-cost supply option.
Renewable Portfolio	HRS §269-92	The state's Renewable Portfolio Standard (RPS) is a key

State Law	Authority	Summary
Standard		driver of energy policy and activities by other stakeholders. The RPS requires each utility to obtain 15% of its electricity sales from renewable sources by 2015, 25% by 2020, and 40% by 2030. Beginning in 2015, electricity conservation measures, such as solar hot water heaters and other demand-side efficiency improvements, cannot be counted towards the RPS. Hawaiian Electric Company is permitted to aggregate renewable electricity generation across its service territories, so Hawai'i Island's renewable electricity generation will offset the lower renewable percentages on O'ahu and Maui. The law further states that the PUC must establish penalties for failure to meet the RPS, but allows the PUC to waive the penalties if the failure was "due to reasons beyond the reasonable control of an electric utility."
Energy Efficiency Portfolio Standard	HRS §269-96	The state's Energy Efficiency Portfolio Standard requires the PUC to establish standards to "maximize cost-effective energy-efficiency programs and technologies" and "achieve four thousand three hundred gigawatt hours of electricity use reductions statewide by 2030." The law allows the PUC to establish penalties for non-compliance and to change the goal of the EEPS. The statute requires the PUC evaluate the EEPS and report before the 2014 legislative session on its effectiveness, but the PUC is otherwise given flexibility to investigate and proceed as the Commission sees fit. The PUC subsequently opened Docket No. 2010-0037 to investigate this requirement (see *Major PUC Dockets*, below).
Public Benefits Fee	HRS §§269-121 et seq.	The Public Benefits Fee is intended to subsidize energy efficiency measures through a surcharge on electric utility bills. Money collected through this surcharge is deposited in the Public Benefits Fund. The Public Utilities Commission is authorized to transfer the proceeds of the PBF to a third-party administrator "to support energy-efficiency and demand-side management programs and services, subject to the review and approval of the public utilities commission." The legislature specifically protected the PBF fund from allocation to the state treasury and also specified the administrator may not spend more than 10% of the PBF fund on administration of the programs, though the PUC is allowed to specify a different "reasonable" percentage.
On-bill Financing	HRS §269-125	On-bill financing is a mechanism whereby utility customers can make investments in energy efficiency or renewable energy that are paid for over time through

State Law	Authority	Summary
		surcharges on utility bills. The state legislature directed the Public Utilities Commission to open a docket to consider whether this concept would benefit ratepayers in Hawai'i (the PUC subsequently opened docket #2011-0186 to investigate this issue, see *Major PUC Dockets*, below). Though the legislature requires the PUC investigate the concept, it leaves it to the PUC's discretion how to proceed with the investigation and whether or not to implement a program in the future. On-bill financing could provide an essential "no upfront cost" financing mechanism for dramatically increasing the availability of low-cost renewable electricity and energy efficiency technologies, particularly for low-income customers. The main drawback is that is would only be available to utility customers, so any off-grid energy consumers would not have this option available.
Net Energy Metering	HRS §§269-101 et seq.	The legislation establishes a framework for net energy metering to encourage additional distributed renewable electricity generation. This is one of the most successful renewable energy programs developed in Hawai'i. The legislature set some initial program baselines, though it reserves to the PUC discretion to modify the policies.

Hawai'i Clean Energy Initiative

In 2008 the State of Hawai'i and the US Department of Energy (DOE) formed a partnership that established goals for electricity, energy efficiency, and transportation fuels for the state. This partnership is known as the Hawai'i Clean Energy Initiative (HCEI). HCEI sets a goal of increasing "clean energy" throughout the state to 70% of projected 2030 electricity demand, in a combination of 40% renewable generation and 30% energy efficiency. The goal for transportation fuel is also to reduce consumption by 70% by 2030.[25]

Subsequently, Hawaiian Electric Industries (the owner of Hawai'i Island's electric utility HELCO) made a commitment with two state agencies, the Department of Business, Economic Development, and Tourism (DBEDT), and the Division of Consumer Advocacy, (part of the Department of Commerce and Consumer Affairs), to adopt and pursue and number of energy policy goals. This is known as the HCEI Energy Agreement.[33] DBEDT is the primary state representative to the Hawai'i Clean Energy Initiative.

The state's commitments under the Hawai'i Clean Energy Initiative and the HCEI Energy Agreement constitute state energy objectives, though they are not legally binding upon many key decision-makers, including the State Legislature, the Public Utilities Commission, and the County of Hawai'i. Over time, the state has

pursued some HCEI goals while delaying or rejecting others. For example, in 2012, the Governor of Hawai'i formally requested Hawaiian Electric Company investigate the potential of importing liquefied natural gas to the state, which was excluded from consideration under HCEI.[34] Nonetheless, HCEI has had a significant impact on the development and implementation of energy policy throughout the state over the last four years.

Hawai'i Public Utilities Commission

The Public Utilities Commission (PUC) is the most important decision-maker in the electricity sector for Hawai'i Island and throughout the state. The PUC is responsible for governance of the State's public utilities, and by law (HRS §269-16) must ensure utility rates are "just and reasonable."

In addition to its responsibility to regulate the state's four electric utilities, the PUC is also responsible for regulating 216 other public utilities and 1,262 passenger and property carriers.[35] The PUC employs a staff of 62, but 17 funded positions cannot be filled because the PUC lacks sufficient office space at its current location, and moving the Commission to an adequately sized building has not been approved by the State Legislature.[35] In addition, while the PUC collected revenues of more than $17 million in the last fiscal year, 57% of those revenues were diverted to the state General Fund.[35]

Authority

Hawai'i Revised Statutes § 269 establishes the PUC and enables its powers and authority. The three members of the PUC are appointed by the Governor and serve staggered six-year terms. The Governor also appoints the chairperson of the Commission.

The PUC is given wide latitude in the regulation of public utilities in the state. Under HRS § 269-6, the PUC is granted "general supervision...of all public utilities," and "may consider the need for increased renewable energy use in exercising its authority and duties..." Under HRS § 269-7 the PUC has the power to, among other things, "examine...all matters of every nature affecting the relations and transactions between [the utilities] and the public or persons or corporations."

The PUC has the same powers as the circuit courts to compel the attendance and testimony of witnesses under oath, including administering punishments for contempt (HRS § 269-10). Under § 269-27.2, the PUC must investigate the availability of non-fossil fuel electricity and "may" direct the utility to acquire such energy.

The Commission was designed by the legislature to be somewhat insulated from political pressure from either the executive or the legislative branches; however,

the PUC operates within the state statutory framework and is also to some extent bound by its own precedents and prior policy statements.

Role of the Consumer Advocate

The executive director of the Division of Consumer Advocacy, Hawai'i Department of Commerce and Consumer Affairs serves as the Consumer Advocate. The role of the Consumer Advocate is to protect and advance the interests of Hawai'i's customers of regulated public utilities and transportation services. The Consumer Advocate therefore has a crucial voice in Public Utilities Commission proceedings.

During utility rate cases and major energy policy dockets, the Consumer Advocate represents the interests of utility customers and helps the PUC ensure rates remain fair and reasonable. However, this can be a challenging responsibility, particularly since the funding of the Consumer Advocate's office is small and the Consumer Advocate must effectively protect the interests of utility customers while there is great uncertainty about the future cost of energy due to a rapidly changing technology and policy landscape.

Major Public Utilities Commission Dockets

Public Utilities Commission dockets are public, formal proceedings where utility-related decisions are made. The County of Hawai'i has programs, policies, departments, obligations, plans, and new initiatives that are impacted by the decisions of the PUC. The County also represents island residents, whose interests are not necessarily represented by HELCO or the Consumer Advocate. Therefore, it is incumbent upon the County to actively participate in PUC proceedings in order to influence energy policymaking that affects the island's power system.

The outcomes of all PUC dockets are important in determining electricity policy; however, the dockets summarized in Table 7 are the essential PUC dockets affecting the electricity sector on Hawai'i Island. In addition, any new utility-scale electricity generation projects proposed for the island must be approved by the PUC in a new docket. Several of the dockets summarized below have been closed or deferred; however, decisions in those dockets continue to have significant impacts on the energy system, so they are included for reference.

> The outcomes of PUC dockets are critical for determining electricity policy on Hawai'i Island.

TABLE 7. SUMMARY OF MAJOR PUBLIC UTILITIES COMMISSION DOCKETS

Docket	Importance	Summary
Integrated Resource Planning (#2012-0036)	Critical	The next HELCO Integrated Resource Plan will guide the future of the utility's electrical supply and grid investment decision-making. The utility will develop short- and long-term plans for electrical energy supplies in the County. Decisions made in the IRP docket will affect the electricity supply situation on Hawai'i Island for decades. The IRP docket is one of the most important dockets in which the County can advance its citizens' electrical energy goals.
Reliability Standards (#2011-0206)	Critical	The Reliability Standards docket relates to improving integration of renewable energy onto the existing electric grid, developing operational rules and metrics for ensuring reliability of the power system, and analyzing technical studies of the capabilities of the state's electric systems. The results of the Reliability docket will set the "rules-of-the-game" for assessing electric service and will have a significant impact on the outcomes of other dockets. PUC decisions in this docket could result in a restructuring of the electric power market on the island. Act 166 of the 2012 session of the State Legislature gave the PUC power to directly regulate Independent Power Producers by specifying reliability standards for their electricity output. The PUC can establish standards that open up new competition in the power market, through provision of ancillary services to the system by third-parties
Feed-in-Tariff (#2008-0273)	Will be reviewed in 4Q2012	The Feed-in-Tariff (FIT) docket establishes a new method for interconnection of distributed generation into HELCO's grid. According the PUC Decision & Order filed Sept. 25, 2009, FIT is a mechanism intended to "reduce the State's fossil fuel dependence and accelerate the acquisition of renewable energy."* The FIT is designed to simplify the process of integrating new renewable sources by providing more certainty as to the procedure and substantive requirements for interconnection, and by guaranteeing pre-established payment rates for energy delivered to the grid. The Reliability Standards Working Group began in this docket before being transferred to its own proceeding. On Hawai'i Island, just one project has successfully interconnected to the power system under this program. Many questions have been raised by the utility, local government, and the private sector about the design and implementation of this program. The PUC will consider in 4Q2012 whether to modify the FIT given the performance of the program in the last 2 years.
Revenue Decoupling	Approved, can be reevaluated in next rate case	The goal of decoupling, as stated by the PUC, is "to remove the disincentive for the HECO Companies to aggressively pursue Hawai'i's clean energy objectives" by streamlining rate increases and to a certain extent guaranteeing the utility stable or rising revenues even if electricity sales fall due to energy efficiency improvements or new renewable energy generation. There are no performance metrics associated with decoupling as implemented by the PUC, so the utility is not forced to demonstrate it is in fact moving more aggressively to integrate renewable energy into the system. Revenue decoupling has the effect of putting upward pressure on electric rates that are already extraordinarily high, with no

*; Docket No. 2008-0273, p. 1.

Docket	Importance	Summary
		guarantee that other benefits (such as smart grid improvements or increased access to the island's power grid) will accrue to ratepayers. This docket is now closed and so there is no way to participate. However, the potential implications of revenue decoupling on island electric rates warrants special attention, and the PUC may revisit decoupling in future rate cases (HELCO filed its latest rate case application in August 2012). (Note: this policy is discussed in more detail below, under *Long-term Vision: Energy Sustainability*).
Energy Efficiency Portfolio Standard (#2010-0037)	High	The PUC opened this docket on March 8, 2010, pursuant to HRS §269-96. The investigation will consider issues relevant to achieving the underlying statutory requirements, including which entities are responsible to meet the Portfolio Standard, what is the relationship between the Portfolio Standard and other energy policy initiatives and objectives, and what are the appropriate baseline and interim goals for achieving the Standard (statutorily established at 4,300 GWh by 2030). On January 3, 2012 with Decision and Order #30089, the PUC laid out a framework for further consideration of the issue. No penalties for failing to meet the standard will be applied at this stage. The PUC will rely on input from the Technical Working Group (TWG) to advise the Commission on implementation of the EEPS going forward. Because the PUC has not completed its investigation of the EEPS requirements, there is no certainty about how the standard will be achieved throughout the state. However, the Public Utilities Commission stated that, at least initially, the bulk of energy efficiency savings will be achieved through the activities of SAIC, the Public Benefits Fund Administrator.*
On-bill Financing (#2011-0186)	High	On-bill financing is a mechanism whereby a property-owner or renter can invest in renewable energy or energy efficiency and pay for the investment through an assessment on the customer's utility bill. This is a powerful way to finance distributed renewable energy and energy efficiency for those without the capital to invest in a new system. The Commission opened the docket to "examine the implementation of an on-bill financing program" for residential electric utility customers. Act 204 (2011) directed the PUC to investigate on-bill financing. The PUC is authorized by Act 204 to implement an on-bill financing program if it deems it viable. After lobbying against the passage of Act 204, Hawaiian Electric quickly submitted a new tariff to the PUC to implement its own version of on-bill financing. The PUC is considering that request at the same time as it complies with the state law to investigate the on-bill financing mechanism.
HELCO 2013 Test Year Rate Case (#2012-0099)	High	On August 16, 2012, HELCO filed an application for a rate increase. The County can take a more active role in ensuring its interests and the interests of Hawai'i Island residents are reflected in the next rate case decision through intervention and participation in the HELCO rate case proceeding. As noted above, this is also a chance to revisit revenue decoupling.

* While the PBF is an important source of efficiency funding, it is closely monitored by the PUC and the County will have good visibility into how effective it is through participation in the Energy Efficiency Portfolio Standard docket.

Docket	Importance	Summary
Intra-governmental Wheeling (#2007-0176)	High	Wheeling is the act of transmitting electricity over the existing transmission system for consumption at a location other than where the power is produced. Obviously this is what the utility does continuously, but the difference is that a third party is not permitted to use the electric power system in this way. The legislature and DBEDT requested regulatory changes to facilitate purchases of renewable energy by state agencies, including through mechanisms such as wheeling, and the PUC opened the docket on June 29, 2007. However, the proceeding was later suspended at the request of DBEDT in order to focus on other pending dockets after the HCEI Energy Agreement was signed in October 2008. The PUC eventually ordered the reinstatement of the proceeding on Nov 10, 2010. The Commission indicated the proceeding should closely follow the developments of RSWG and the TSG in the Feed-in-Tariff docket (now part of the Reliability Standards docket). In an order filed November 12, 2010, The PUC rejected any suggestion to expand the scope of the proceeding to include other forms of wheeling besides "intra-governmental" wheeling. This docket is on hold pending the completion of the work of the RSWG. However, this docket could ultimately provide much more flexibility to the County in procuring and utilizing renewable electricity, so it should be considered a high priority for County participation once it resumes.
Biodiesel Supply Contract (#2012-0185)	High	On January 6, 2011 the HECO Companies filed an application requesting approval of a 16M gal/yr., 20 year biodiesel supply contract between HELCO and ʻAina-Koa-Pono (Docket #2011-0005). Among other things, HELCO requested permission to dispatch its diesel generators at Keahole using the biodiesel from ʻAina-Koa-Pono as if the biodiesel was priced the same a conventional diesel, and also in such a way as to ensure use of the full 16M gal contemplated in the contract. Preferential dispatch is currently permitted for certain grid stability reasons, but it is unprecedented to lock-in sub-economic dispatch for the next 20 years. The PUC ultimately rejected the proposal based on its excessive price. The PUC indicated that high-priced energy may not be approved, even if it is renewable, and that a biofuels decision framework should be developed for future proposed biofuels off-take contracts. On August 2, 2012 HELCO and its owner Hawaiian Electric Company applied for approval of a revised contract with ʻAina-Koa-Pono, now with a reduced price for the biodiesel.
Rule 14-H Revision (#2010-0015)	Completed	Rule 14-H determines whether customer can interconnect distributed generation to the grid. The main objectives of HELCO's Rule 14-H are to ensure the safety of people and equipment, maintain the reliability of electrical distribution system, and to maintain acceptable power quality and efficiency levels on the grid. The revisions to Rule 14-H were praised by many stakeholders for standardizing interconnection policy and providing some certainty to project developers regarding interconnection standards and requirements.

Long Term Vision: Energy Sustainability

Overview

Energy sustainability is an alternative to the island's current petroleum dependence, relying on local, renewable resources to meet the energy needs of the island's residents and visitors and power the island's economy. Hawai'i Island has the renewable resources needed to meet the island's energy demand, but energy sustainability is such a departure from the status quo that it will take many years until the energy system can realistically be expected to transition from 95% dependence to complete self-reliance. In the meantime, energy costs and impacts are expected to rise, costing island residents and businesses millions of dollars every year.

In addition to the long timeline associated with this transformation, the vision of energy sustainability could take many forms, depending on decisions that are made about the preferred energy future for the island. The current electric utility plans to incorporate biomass and biofuels based generation (from agricultural feedstocks potentially located in the Hamakua and Ka'u regions) combined with additions to geothermal production. This is consistent with scenarios and models developed for the Hawai'i Clean Energy Initiative that envision large increases in many energy technologies, including biofuels, geothermal, waste-to-energy, wind, and solar development.

Achieving energy sustainability could also involve adding other desirable characteristics to the energy system, such as reliable and convenient mass transit, more comfortable and efficient homes and businesses, and more distributed and resilient energy sources. Moving towards energy sustainability will result in a dramatic shift from investments in petroleum-based infrastructure to renewable technologies. When making decisions about which renewable energy resources to utilize, stakeholders can also help direct the investments toward community-based energy systems that channel energy financing activities into deployments that can magnify economic benefits.

Given the modest scale of the island's current energy system compared to its vast renewable energy potential, it is probable that development of, for example, hundreds of megawatts of geothermal energy or thousands of acres of biofuels production is feasible on Hawai'i Island. However, implementing some potential projects could involve large-scale energy development in small island

communities, which must be weighed against the benefit of renewable energy. Despite broad support for energy sustainability, there are significant technical, economic, and political challenges that have so far limited success to just 5% energy independence after decades of effort.

Achievement of the long-term vision of a completely self-reliant and sustainable energy system for the island will require the leadership of the County of Hawai'i. Key challenges include the costs of financing some renewable energy technologies, the technical challenges of interconnection and power system operations, the overwhelming reliance of the transportation sector on imported petroleum products, and the lack of effective government policies and coordination to ensure new energy projects are implemented.

Uncertainty and Long-term Planning

Over the past 20 years, the island has steadily increased energy consumption. However, conditions of the more recent past have diverged considerably from long-term trends. The economic recession and the recent volatility and high prices in energy markets have both contributed to this divergence. As a result, projections of future conditions made just a few years ago (for example, in HELCO's third Integrated Resource Plan) have not fared well.

Long-term forecasting in energy systems is notoriously unreliable.[41,42,43] Energy systems are extraordinarily complex and subject to significant influence from a wide variety of policy, market, and economic characteristics and developments. Making projections of an energy system requires developing a series of assumptions and value judgments that can produce a wide variety of outcomes. Controversy about the validity of these kinds of assumptions and judgments often detracts from the viability of any recommendations that may be developed, even if the recommendations are "no-regrets" policies that will be beneficial regardless of how future conditions may change (for example, improving the mass transit system will be beneficial to island residents regardless of how fast electric vehicles come to market or whether biogasoline can ever be produced at a commercial scale on the island at some point in the future).

In the case of the County of Hawai'i, the government has limited jurisdiction and authority over the island's energy system, and in many ways is just beginning the process of building and strengthening an energy program. Official planning processes for the energy system are developed according to state law by state-level agencies, and the County is permitted an advisory role (see Role of the County of Hawai'i, below).

For these reasons, and to avoid duplicating the work of state and county transportation planners and the electric utility's Integrated Resource Planning process, the scope of this roadmap is focused on the implementation details of

specific, actionable recommendations for programs the County can legally undertake today. Given the great uncertainty of the future of the island's energy system and the need to quickly build the capacity of the County's energy program, the planning horizon is narrowed to a five-year roadmap. Five years is long enough that it can encompass a relatively large number of high-priority programs while being short enough that the suggestions will likely still be relevant at the end of the planning horizon. In other words, the recommendations in the five-year roadmap are designed to be beneficial to the County and the island regardless of expected global, national, or state-wide developments in the next five years, and they do not require the action of stakeholders outside the County's control, such as HELCO, the PUC, or the state legislature.

Hawai'i Island Energy Sustainability Potential

The Island of Hawai'i has significant, diversified renewable energy resources. Currently operating facilities already produce renewable electricity from geothermal, wind, hydro, and solar sources, and a new biodiesel refinery was constructed in 2012 that can produce biodiesel from certain agricultural and waste oils. These resources have not been utilized to their maximum potential, and other renewable energy resources on the island are not used at all, including biomass, other advanced biofuels, waste-to-energy (both wastewater and municipal solid waste), and ocean energy (wave, tidal, and thermal).

Table 8. Hawai'i Island Renewable Resource Potential Estimates[12]

Technology	Resource Estimate	Source
Biofuels	8.8M–87.6M gal/yr	Hawai'i Bioenergy Master Plan[36]
Solar PV	232 MW	Booz Allen Hamilton/NREL
Wind	85 MW*	HNEI/GE[37]
Geothermal	1,396 MW	GeothermEx, Inc.
Hydropower	20 MW	National Renewable Energy Laboratory
Biomass	50 MW	National Renewable Energy Laboratory
Waste	8 MW	Booz Allen Hamilton
Ocean (statewide)	85 TWh/yr†	Electric Power Research Institute
Energy Efficiency	180 GWh	Booz Allen Hamilton[38]

* This estimate refers to the amount of wind capacity that can be safely integrated into the existing power grid without major modifications. It significantly understates the actual resource potential.

† The study that produced this estimate examined wave energy only. Another report by US DOE examining ocean thermal energy is expected to be released in 2012.

According to various published estimates, the renewable energy potential of the island vastly exceeds the island's current energy needs. Estimates vary, but the table above summarizes the possible extent of renewable resources available on the island from a number of studies. For each renewable technology, the table indicates the estimated resource for Hawai'i Island (units vary by technology). More details on each of these technology options are provided in the following sections.

Seismic, Volcanic, and Other Natural Hazards

Hawai'i Island experiences many forms of natural disaster, including earthquake, volcanic eruption, tsunami, typhoon, flood, wildfire, and the occasional tornado. Two of the major hazards likely to impact energy supply and delivery include earthquake and volcanic eruption.

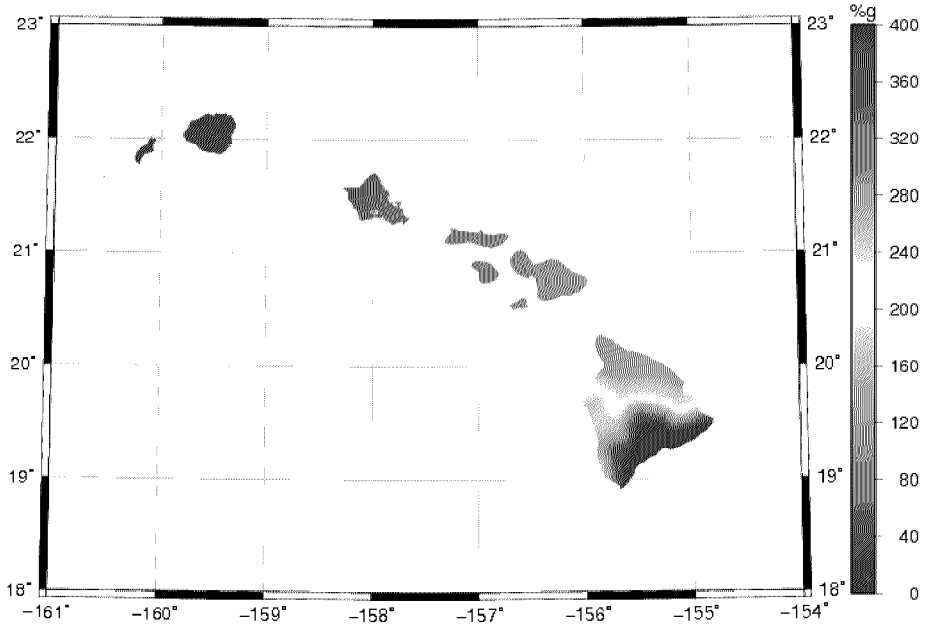

Figure 32. Ground Motion Hazard Map, State of Hawai'i[39]

The Ground Motion Hazard Map of the state of Hawai'i prepared by the US Geological Survey indicates the relative ground motion hazard due to earthquakes. A substantial portion of Hawai'i Island is at elevated risk, including most of Ka'u, Puna, and the major population centers in Hilo and Kailua-Kona.

Hawai'i Island also faces significant risks from volcanic eruption and lava inundation. Much of the island is classified lava flow zone 3 or higher, indicating areas downslope or adjacent to the active vents of Kilauea and Mauna Loa.

The significant risks facing many parts of the island suggest the island's energy system should be developed to include redundancy in case of failure or destruction of any of the island's energy supply facilities or associated infrastructure (including the island's harbors and airports, fueling stations, etc.). In addition, a more distributed energy supply system that does not rely on vulnerable transmission and delivery infrastructure will help mitigate the effects of future natural disasters.

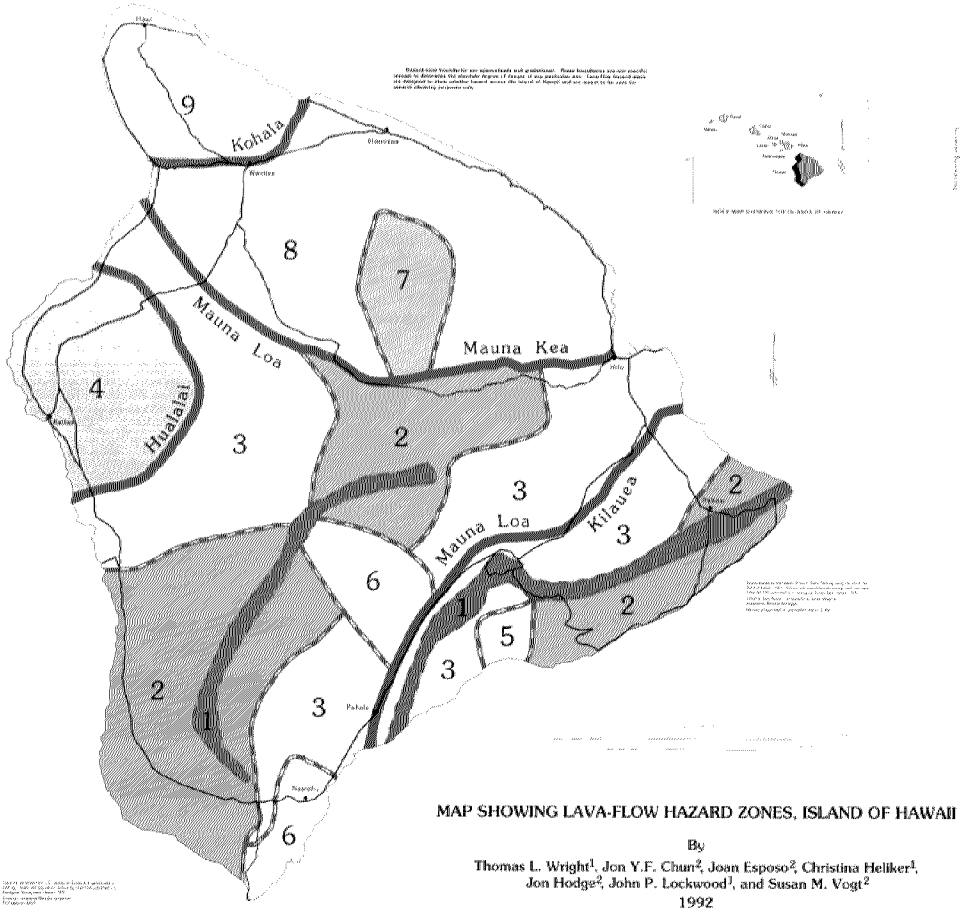

FIGURE 33. LAVA FLOW ZONE MAP, HAWAI'I ISLAND[40]

All types of development, including energy production and delivery infrastructure, which can be particularly vulnerable, should be carefully evaluated to include the risks posed by natural hazards on Hawai'i Island.

Approaches and Challenges to Energy Sustainability

The challenges to achieving energy sustainability are complex and inter-related, a result of the complexity and interconnections of the current energy system. Energy issues are closely linked to many aspects of island life, which means that addressing one issue in isolation is unlikely to be completely successful, and may in many cases have significant unintended consequences. Decision-makers can employ a "systems thinking" approach to help illuminate these linkages and develop policy. One of the most important tasks is to structure government and private investments in the energy system to better achieve energy objectives.

Energy is a critical input into the economy, but the island's isolation and overwhelming dependence on one energy source—petroleum—magnifies energy's importance to Hawai'i Island. For example, consider the issue of local food production. About 85% of the food consumed on the island is imported from off-island sources, contributing to the island's dependence and vulnerability, in addition to increasing the cost of living for island residents.[44] Transporting food from the mainland requires considerable energy resources (in the form of aviation and marine fuels), while on the other hand upgrading fallow lands to productive use may require extensive irrigation improvements (which itself requires considerable energy resources), linking the prospects of increasing local food production to the challenge of achieving energy sustainability for the island. The linkages between the energy system extend to other important areas, including other kinds of agriculture, tourism, land-use planning and development, water supply, and civil defense. These linkages must be recognized and analyzed as part of any long-term energy sustainability strategy.

The County of Hawai'i has a critical responsibility to facilitate and lead the efforts to achieve energy sustainability. In the short-term, the County can take steps to strengthen its energy program and invest in high rate-of-return projects to lower energy costs to taxpayers. Over the long-term, the County can help ensure a coordinated and well-designed transition by participating in state-level decision-making processes and advocating for the kinds of energy policies that would be beneficial for Hawai'i Island.

Table 9 outlines the overall recommended approach to achieving sustainability in the two major sectors of the energy system on the island: transportation and electricity. The rest of this chapter describes the key long-term challenges and opportunities in more detail. The recommended short-term strategies for the County of Hawai'i are described in the Five Year Roadmap, below.

TABLE 9. PURSUING ENERGY SUSTAINABILITY FOR TRANSPORTATION AND ELECTRICITY

	Transportation	Electricity
Approach to Sustainability	▪ Reduce energy consumption by increasing efficiency of passenger vehicles, reducing the distances traveled, and moving to more efficient modes of transportation ▪ Transition to alternative fuels including electricity	▪ Reduce amount of electricity consumed through efficiency and conservation ▪ Produce and deliver electricity more efficiently ▪ Replace fossil fuel energy sources with renewable energy sources
Challenges	▪ Many stakeholders need to change ▪ No centralized regulatory structure as in electricity ▪ Fewer available sustainable transportation options ▪ Relatively low yearly vehicle sales ▪ Low mass transit use	▪ Electric power grid cannot accept large amounts of variable generation without additional investment ▪ Existing HELCO power plants would need to be displaced ▪ Majority of electricity costs are linked to petroleum prices (avoided cost)
Positive Indicators	▪ Operating costs of electric vehicles are already lower than gasoline or diesel vehicles ▪ Hawai'i is an attractive market to introduce new sustainable transportation technologies (e.g. electric vehicle models, hydrogen buses, etc.)	▪ Utility has achieved 37% renewable electricity generation ▪ Energy efficiency improvements can low the cost of transitioning to renewable energy because less new generation is needed ▪ Renewable generation (solar, wind, geothermal) are available and already lower cost than the status quo ▪ Installations of solar PV have been rising rapidly ▪ Electric utility is centrally regulated so policy can have direct and immediate impact on market
County Strategies	▪ Invest in mass transit system improvements ▪ Monitor the development of alternative fuels ▪ Improve county vehicles and operations ▪ Incentivize electric vehicles	▪ Participate in regulatory and legislative decision making ▪ Maximize energy efficiency and the production of renewable electricity at county facilities ▪ Incentivize renewable electricity and energy efficiency for residents and businesses ▪ Monitor the development of the island's energy resources

Sustainable Island Transportation

Nearly 100% of the island's transportation system is dependent on petroleum fuels. For a variety of reasons, the market for sustainable transportation solutions has developed relatively slowly, especially compared to alternatives in the electric power sector. Alternative fuels for transportation, including electricity and biofuels, have only recently become commercially available. More than 56% of new vehicle sales are light-duty trucks powered with gasoline, and no automobile manufacturer has introduced an electric or hybrid truck to the Hawai'i market. [45] Moreover, any of these transportation solutions requires replacement or conversion of the existing vehicle stock, which would take many decades give the low yearly sales of new vehicles on the island. In addition, alternative *modes* of transport, including the mass transit system, have not yet been embraced widely due to accessibility and reliability issues. Much of the island's public roadways are not designed for safe use by bicycles or pedestrians.

A complete transition to energy sustainability in transportation will require the efforts of a large number of stakeholders (such as car dealers, fuel suppliers, and distributors) that are not regulated or integrated in the same way as electricity sector stakeholders. As with the electricity sector, the County's authority is limited by state law, but it does control most road planning, land use planning, mass transit and fuel tax policy.

There are two main approaches to achieving sustainability in the transportation sector: 1) reduce energy demand through efficiency and alternative transport modes like carpools, mass transit, biking, etc., and 2) replace petroleum fuels with alternatives such as electricity and biofuels.

Reduce Transportation Energy Demand

Reducing transportation energy demand is critical because it can result in immediate reductions in energy expenditures that can be put to other beneficial uses by households, businesses, and government. Equally important, reducing overall transportation energy demand reduces the total amount of energy that must be sourced from renewables in order to ultimately achieve energy sustainability. This can substantially lower the costs of the overall island transition to renewable energy.

Improve Vehicle Efficiency

The relatively low fuel economy of the island's vehicles means that even minor improvements in overall gas mileage result in significant reduction in fuel consumption (fuel economy improvements for low efficiency vehicles save more fuel than improvements for high efficiency vehicles). For example, an improvement

from 10 to 15 miles per gallon saves the same amount of fuel as an improvement from 15 to 30 miles per gallon, assuming the distance traveled remains constant (see Figure 34, below). An increase in the fuel efficiency of the island fleet from its current 16.8 miles per gallon to match Oahu's 21.3 miles per gallon would save an estimated 21 million gallons of fuel annually and is equivalent to a more than 20% reduction in vehicle miles traveled at current efficiency levels. Relatively modest improvements in overall vehicle efficiency thus enable large increases in vehicle use without increasing overall energy consumption.

Electricity, an alternative energy source for transportation discussed in more detail below, also provides an additional efficiency benefit because electric drives are much more efficient propulsion systems than conventional engines. Electric vehicles offer one way to dramatically improve the overall efficiency of the island's vehicle stock.

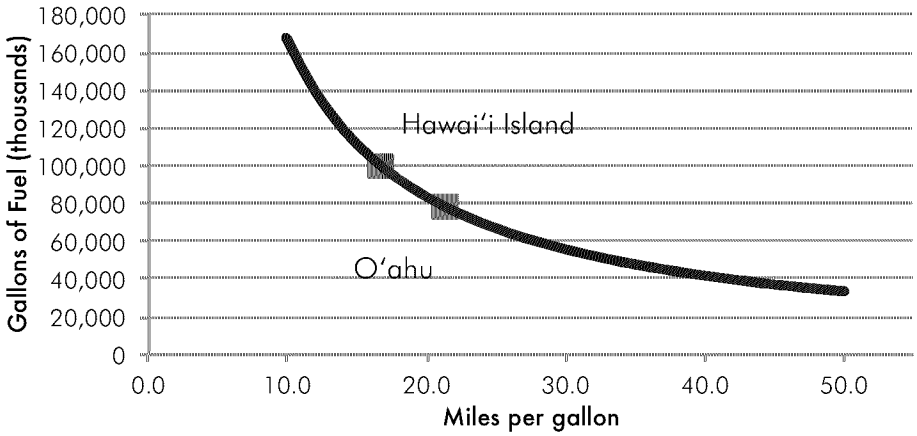

FIGURE 34. HAWAI'I ISLAND TRANSPORT FUEL CONSUMPTION VS. AVERAGE VEHICLE FUEL EFFICIENCY, CONSTANT 2010 VMT[6,8]

REDUCING OVERALL VEHICLE MILES TRAVELED

Because transportation is essential to the proper functioning of the island's economy, achieving a large reduction in vehicles miles traveled may not be feasible especially if there is future population and economic growth. However, vehicle miles traveled can be reduced by thoughtful, coordinated land use planning, a responsibility of the County government. The County can shape the growth of the island's communities and infrastructure to promote accessibility, bike-ability and walkability and provide functional alternative modes of travel, such as improved and expanded mass transit. In a sustainable energy future neighborhood for the island, residents should be able to access basic economic and recreational services without relying on an energy intensive personal vehicle trip.

Unfortunately, these types of programs and policies can come into conflict with the type of suburban, car-focused development that many current and potential residents have come to expect. The County must effectively demonstrate the value of these alternative approaches to transportation in order to have a significant impact on transportation energy consumption.

Replace Petroleum in Transportation with Alternative Fuels

The clearest path to transportation energy sustainability is to *replace fossil fuels for transportation with renewable alternative fuels*[*]. Switching the entirety of the transportation system to renewable energy sources is a substantial challenge. Alternative transportation fuels include electricity, biofuels, and in the future could include advanced fuels like hydrogen. Some alternative fuels require modifications of existing combustion engines, while some are considered "drop-in" and can be used immediately with existing vehicle stock and transportation infrastructure.

Electric Vehicles

Electricity is a highly versatile form of energy that can power a wide range of technologies in a large number of applications. In contrast, other forms of energy, such as gasoline or coal, can only be used by certain technologies and therefore have more limited applications.

Electric vehicles are often touted as the future of the world's transportation systems due to their low operating costs, rapidly falling purchase price, and ability to be easily charged using renewable electricity. Another benefit of electric vehicles is that they may be routinely charged at night, which smooths load curves, allows for use of currently curtailed renewable energy, and potentially lowers overall electric power system costs.

The operating cost per mile of an electric vehicle on Hawai'i island is 47% lower than the typical internal combustion vehicle, even after accounting for the island's extraordinarily high electricity prices (Figure 35). If a household uses a solar PV system to generate electricity at an average cost of $0.28/kWh, the cost of operating an electric vehicle would fall to more than 65% below the cost of an internal combustion engine.

[*] Hawai'i state law uses a definition for alternative fuels which includes some fossil fuels (HRS §243-1) and also references a similar definition in the Code of Federal Regulations Part 490.2 (HRS §196-42).

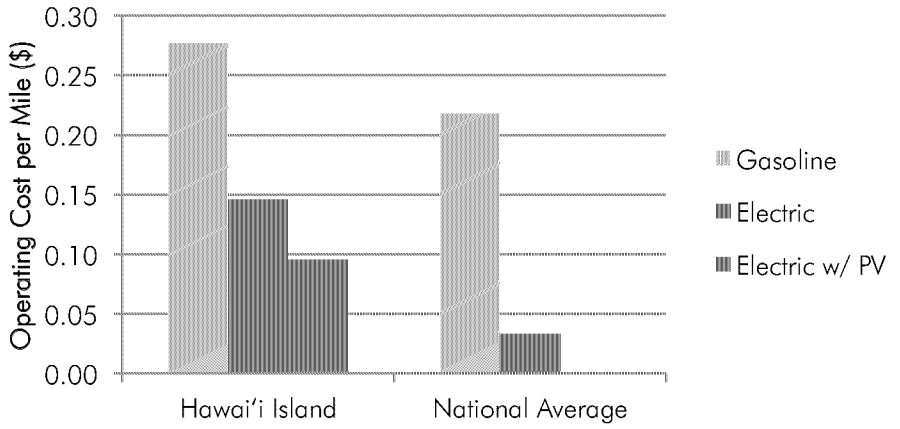

FIGURE 35. OPERATING COST PER MILE FOR ELECTRIC AND INTERNAL COMBUSTION ENGINE VEHICLES, 2011 PRICES.*

Electric vehicles can be purely electric or plug-in hybrid systems with gasoline engines for added range. Currently available electric vehicles have a range of about 100 miles, while electric hybrids could circle the island before needing a charge or a refill.[46] Since 90% of commutes to work on Hawai'i Island take less than 60 minutes, it is likely most vehicle-trips to work could easily be made in an electric vehicle.[9]

The County of Hawai'i is in the planning stage of developing a network of 10 additional vehicle charging stations throughout the island to supplement Better Place chargers available along the Kohala Coast. This network, if developed, would ensure that a driver at any point along any island highways would be within 35 miles of a charging station.

Another promising aspect of electric vehicles is the relatively modest electricity generation requirements of an all-electric vehicle fleet. Electric vehicles convert electricity directly into useful work without using a combustion process that wastes large amounts of energy.† If every vehicle mile traveled on the island were made in a Nissan LEAF, electricity consumption would increase by 48% as compared to 2010. However, producing this energy would only require an estimated 85 MW of geothermal power, or 121 MW of wind, or 260MW of solar PV (Figure 36). In reality, scheduling generation and dispatch and coordination with the current

* Operating cost excludes lifetime maintenance due to lack of available data. Anecdotal evidence suggests maintenance costs for electric drivetrains are significantly lower than for conventional vehicles. Nissan Leaf plug-to-wheel efficiency, and current averages for island fleet economy, national fleet economy, and national electricity price. See: Appendix F.

† Internal combustion engines are so inefficient that even though the existing oil-based power plants only achieve about 32% efficiency, it would still be more efficient to burn biofuel in those facilities to generate electricity for vehicles than to burn biofuels directly in vehicles.

electric power system would be required; however these estimates provide a useful indication of the relative scale of the energy challenge of using electric vehicles to provide mobility to island residents and visitors.

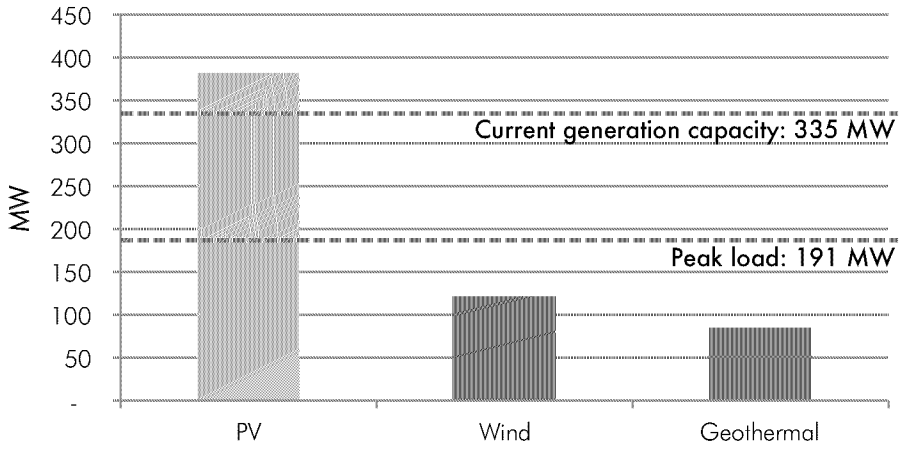

FIGURE 36. NEW GENERATION CAPACITY REQUIRED FOR 100% ELECTRIC VEHICLE-MILES TRAVELED[*][8,47]

The number of electric vehicles on the island essentially amounts to a rounding error. There are just 41 electric vehicles registered in Hawai'i County, representing .02% of all registered vehicles.[†][8] When comparing new car sales each year to the island's current vehicle stock, the data suggests it is unreasonable to assume that the entire vehicle stock can be converted to electric vehicles through gradual electric vehicle penetration growth under market conditions. Even if *all* new car sales starting in 2012 are assumed to be electric vehicles it could take at least 25 years to completely replace the current vehicle fleet.[‡] Hawai'i could transition to electric vehicles more quickly, but it would require a concerted effort.

Nonetheless, electric vehicles offer a way to eliminate dependence of the vehicle fleet on imported energy. While the upfront cost of an electric vehicle is currently higher than conventional counterparts, government incentives can save thousands of dollars off the sticker price of a new EV. EVs also offer substantially lower operational costs than internal combustion engines, and dealerships report low maintenance requirements for electric powertrains and motors.

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[*] Generation capacity requirements calculated based on average Hawai'i Island capacity factors for each generation technology.

[†] This number is almost certainly too high since it includes non-passenger electric vehicles like golf carts.

[‡] Vehicle turnover rate indicates the relationship between the size of the existing vehicle stock (172,000 vehicles) and the number of new vehicles sold each year (new vehicle sales in the last 5 years have ranged between 7,000 and 3,400 per year). See: Appendix F.

The electric vehicle industry is still in its infancy. Only four electric or electric-hybrid passenger vehicle models are commercially available in Hawai'i. There are not yet electric versions of light-duty trucks, a category which constituted about 58% of new vehicles purchased on Hawai'i Island in 2010.[45] Nissan has reported selling 9,674 LEAFs in the US since its December 2010 debut, out of global sales of 21,000.[48] Figures for other brands are not yet available.

Because Hawai'i Island is a small and remote market, local government policies and incentives are unlikely to be sufficient to influence the major companies involved in electric vehicle production and distribution. Achieving rapid adoption of electric vehicles on Hawai'i will require the concerted efforts of government and the private sector working in close partnership.

Biofuels for Transportation

The lack of electric vehicles on the market and the slow turnover of the island's vehicle stock indicate that a transportation system running on sustainable energy could depend on the availability of drop-in alternative fuels such as biofuels, particularly if upfront costs of electric vehicles do not become competitive conventional vehicles relatively quickly. However, biofuel-powered vehicles still rely on a relatively inefficient technology: the internal combustion engine. For this reason, the use of biofuels needs to be combined with increases in vehicle efficiency and reduction in vehicle miles traveled, as discussed above.

Biofuels suitable for the transportation sector include biodiesel, biogasoline, and bio-jet fuel. Biodiesel is commonly found on the mainland and even in Hawai'i, but biogasoline and bio-jet fuel production processes are still being tested and refined, and await scale-up to a commercial level.

Big Island Biodiesel officially opened a biodiesel refinery in Kea'au in July, 2012 that will be capable of producing 5 million gallons of biodiesel per year, or just under half of all diesel fuel consumed for ground transportation on Hawai'i Island.[49] The proposed 'Aina Koa Pono biofuel production facility would sell 16 million gallons of biodiesel directly to Hawaii Electric Light Company for use in their diesel generators, leaving 8 million gallons available for other uses, according to company estimates.[50]

While the island clearly has the ability to satisfy current diesel fuel transportation requirements with locally produced biofuels, replacing current gasoline and jet fuel consumption represents a much bigger challenge.

Fortunately, there is advanced research ongoing in Hawai'i to develop new sources of renewable biofuels. The US Department of Defense supports biofuel research and development and has shown an interest in large-scale biofuels projects in Hawai'i. In addition, a subsidiary of the technology corporation Honeywell International, Inc. is developing a pilot biorefinery in Kapolei on O'ahu.

The biorefinery is intended to process biomass and algal residues into renewable biodiesel, biogasoline, and bio-jet fuel. The capacity of the pilot facility is estimated at about 60,000 gallons per year though that the company claims the technology can later be scaled up to produce 50 million gallons of biofuels per year.[51]

Potential Biofuel Resources on Hawai'i Island

Despite the fact that Hawai'i Island is vastly larger than other islands in the state, much of this land is not available for production. Estimates of total land area for biofuels vary widely, depending on what portion of existing agricultural land is assumed to be converted to biofuels production. Rocky Mountain Institute estimated in 2008 that Hawai'i Island has 45,200 acres available for biofuels production (not including 11,800 acres currently in food production). This is less than both Kaua'i (50,600) and Mau'i (53,400).[52] Figures for Kauai and Maui include converting land currently used for sugar production to produce biofuels.

The state Bioenergy Master Plan estimates that Hawai'i Island could produce between 8.8 and 87.6 million gallons of biodiesel per year without converting currently utilized cropland.[36] The island's current diesel consumption falls within this wide range with about 12 million gallons per year for transportation and another 20+ million gallons for electric power, agriculture, and industrial uses.

Many diesel engines are capable of using 100% biodiesel (B100), though there can be operating restrictions for specific engine types. Drop-in bio-gasoline is not yet commercially available but could potentially be produced in Hawai'i in sufficient amounts. Bio-jet fuels are also being developed, particularly by the US military and some airlines. The military's interest in biofuels in general has some energy stakeholders considering Hawai'i Island for biofuels development, though there have been no public announcements of firm plans.

The promise of a reinvigorated agricultural industry that simultaneously reduces energy dependence makes support and development of a biofuels industry a goal of many business, community, and political leaders. Much of Hawai'i Island is not suitable for growing biofuels, however, so competition for high-quality, irrigated land could become an issue. The County should continue to help local communities discuss and decide how to achieve energy goals without harming other important interests, such as ranching, farming, and recreation.

Hydrogen

Hydrogen is one the densest energy sources by mass, meaning that pound for pound, hydrogen holds more energy than most any other fuel. However, energy

density by volume is extremely low compared to alternative fuels, so hydrogen delivery and storage is much more expensive. *

Hydrogen is a versatile energy carrier that could play a transformational role in the future of Hawai'i Island's transportation system and overall economy. Hydrogen-fueled vehicles are not yet commercially available, but the energy storage and delivery potential of hydrogen, if developed and implemented on the island, could radically alter the energy supply and demand of transportation fuels.

A 2008 study prepared by the consultancy Sentech concluded that production of hydrogen for the island's transportation energy needs is technically feasible by tapping the island's geothermal resource.[53] However, the authors also concluded it would take more than 737 MW of geothermal capacity to produce enough hydrogen to completely satisfy the transportation demand of the island (the authors estimated 120 million gallons of gasoline).

The primary obstacle to hydrogen-based transportation options is the high cost of hydrogen production and delivery. Most research and development efforts currently underway are focused on bringing the costs of production down.

There is an on-going attempt to bring between one and four hydrogen buses to Hawai'i Island as a demonstration project, both for the County mass transit fleet and the National Park Service's Hawai'i Volcanoes National Park bus fleet. The project has been delayed due to liability questions, but should be pushed forward so more data can be collected and compared.

Renewable Electricity

The Island of Hawai'i is well positioned to achieve complete sustainability in the electricity sector. The island possesses significant, diversified renewable electricity resources, and the electric utility has already achieved 37% renewable generation in 2011, mostly through purchasing geothermal, wind, and hydroelectric generation from independent power producers.

However, despite the electric utility's plans to continue to acquire renewable energy (from biomass, biofuel, and new geothermal resources), several technical, policy, and financial issues may prevent achievement of a full transition to renewable electricity.

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* Hydrogen gas has an energy density of 142 MJ/kg, compared to 52 MJ/kg for natural gas (HHV), or 2.73 times greater. Hydrogen density by volume is just 2.55 grams/ft^3, compared to 22 grams/ft^3 for natural gas, nearly 10 times less.

From a technical perspective, the current design and operation of the island's power system limits the amount of energy it can accept from variable resources such as the wind or sun. "Firm" resources such as geothermal or bioenergy-based combustion are not subject to this limitation. Contributing factors include the flexibility and responsiveness of the power system, including the generation plants, the transmission and distribution wires and substations, and the communications network that permits remote operation of individual system components throughout the island. Safety and reliability are also important considerations that may affect the feasibility of different technologies, particularly with respect to the earthquake and volcanic risks present on Hawai'i Island.

There are several commercially available technologies that can help enable integration of variable renewable resources including energy storage, distributed energy resources, and technologies to modernize the power system. Without investments in these technologies, solar and wind will not make a substantial contribution to displacing the remaining 63% of petroleum-based electricity.

Most states, including Hawai'i, tightly regulate the production and delivery of electricity due to its importance to the economy and society in general. Accordingly, government policy is central to the development of energy resources and the future of the island's energy system. Significant policy changes are already underway to encourage a sustainable future for the island and the state, but the changes that have already occurred are mostly incremental and have not resulted in large increases in renewable energy production. Further regulatory and policy innovations will be required to push the island to complete sustainability.

Energy Efficiency Improvements

Energy efficiency improvements can be viewed as a renewable energy resource because these improvements reduce overall demand, which is currently met with petroleum resources. If the residents, businesses, and government of Hawai'i Island take steps now to improve energy efficiency, it could dramatically lower the overall cost of transitioning the island's energy system to renewable sources. Fortunately many energy efficiency improvements actually save the customer money over their lifetime.

Whenever thinking about energy efficiency, it is important to consider the *service* actually desired and provided by the energy consumed. Energy is not typically desired in and of itself, rather it is the services that can be provided by using energy that drives the demand for energy. In other words, consumers desire the light emitted from a bulb, not the electricity flowing through it. Energy services may be distinct from the physical units of energy demand, and include things like

household lighting and comfort, individual mobility, dedicated power for manufacturing, etc.

For example, a modern lightbulb may require 13 W of power, while producing 30 lumens of actual light. But if a user desires a soft glow (somewhat less than 30 lumens), and therefore uses an elaborate lampshade to provide the desired lighting characteristics, the overall efficiency of this hypothetical system may be improved by designing a fixture that produces the desired lighting but only requires a 5 W bulb instead. The energy *service* desired (in this example, the lighting itself, measured in lumens) is key because demand side adjustments to the energy system can have dramatic impacts on the system as a whole, and are often less costly than their supply side equivalents. Given improvements realized in the past and currently planned levels of investment, one can expect continuous improvement as measured by the energy service provided over the long-term.

The State of Hawai'i is already a leader in energy efficiency for government operations. The state's energy performance contracting initiative began in 1996 and has saved more than $270M in energy costs.[54] In 2009 the state adopted an aggressive statutory goal to achieve 4,300 GWh in annual electricity savings statewide by 2030, equivalent to 30% of estimated electricity demand. In 2010, the state was recognized as a national leader in energy efficiency by the American Council for an Energy-Efficient Economy.[54]

The sustainable energy future of Hawai'i Island should include widespread energy efficient technologies. Energy efficiency can be improved at all scales and in all sectors of the energy system. At the end-use level, passenger vehicle fuel efficiency and household appliances like dryers and refrigerators can be improved. Existing buildings can be upgraded so they require less energy for services such as lighting and comfort, and new construction can incorporate high efficiency design techniques to substantially lower energy needs. At a larger scale, the transportation network can be improved with expanded mass transit opportunities, and new land development can be coordinated with the existing system to eliminate the need for redundant infrastructure and improve connectivity between communities. The electric power system can also be modernized so that generators waste less fuel and the grid loses less electricity in transit to the load. Converting power generation to renewable sources that do not require fuels can eliminate large amounts of imported energy.

This chapter focuses on the electricity sector, including end-use and building efficiency, as well as the efficiency of the overall electric power system. Transportation sector efficiency improvements are discussed in more detail in the previous chapter, Sustainable Island Transportation.

Long-term End-Use Energy Efficiency Potential

The most recent assessment of energy efficiency potential in Hawai'i was conducted by the consultancy Booz Allen Hamilton in 2010.[12] Booz Allen Hamilton focused their analysis on the existing building stock of the state, and the company estimates that about 50% to 70% of the state's energy efficiency goal could be satisfied by retrofits to existing buildings. The report estimates that between $50M and $100M dollars must be invested per year in order to meet the 4,300 GWh target established by the Energy Efficiency Portfolio Standard. An earlier analysis concluded that about 80% of the state's existing building stock would need to be retrofitted to obtain these results.[38]

The assessment concluded that 180 GWh could be saved on the Island of Hawai'i (about 16% of electricity demand of 1,110 GWh in 2011). The largest potential contributor was single-family homes (more than 50% of potential savings), followed by retail and hospitality sectors (these three sectors accounted for more than 85% of estimated potential savings). According to the study, residential solar water heating and residential lighting are areas with the highest potential for energy savings in the state. Comparing a building in Hawai'i to the average US home, it can be estimated that up to one third of residential electricity demand is due to cooling.

The Public Utilities Commission has indicated in the Energy Efficiency Portfolio Standard docket (see Major PUC Dockets and Major Energy Laws, above) that it will require updated energy efficiency potential studies for each utility service territory in order to facilitate planning. This suggests a new potential study will be conducted for the Island of Hawai'i shortly, possibly within the next two years.

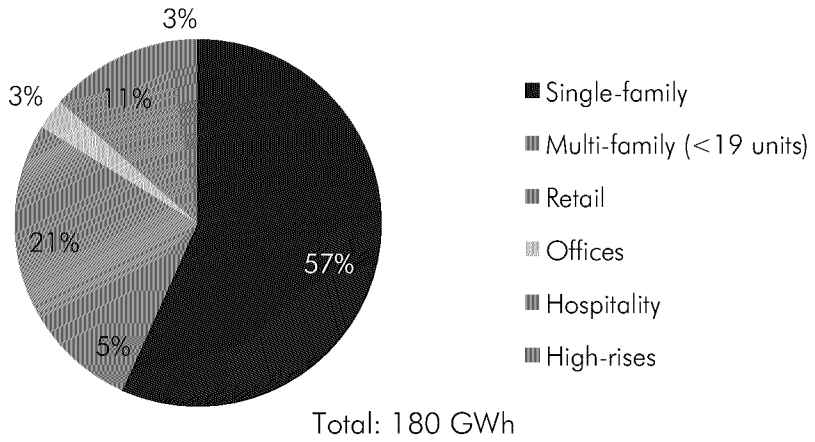

Figure 37. Energy Efficiency Potential Savings, Hawai'i Island[38]

Hawai'i Energy

Hawai'i Energy is the brand name of the ratepayer-funded energy efficiency improvement program (the fund is known as the Public Benefits Fund). The PBF is administered under contract by Science Applications International Corp. (SAIC), the defense and government services contractor. The program is allocated more than $30 million each year from the Public Benefits Fund surcharge on the customer bills of the utilities controlled by Hawaiian Electric Company.[55] In the past, residents of Hawai'i Island have contributed substantially more to this program than they have received in benefits, due to the program's focus on large-scale energy efficiency improvements that have been easier to make on O'ahu.[56]

SAIC is aware of the discrepancy between contributions and benefits from the Public Benefits Fund for Hawai'i Island customers and has made attempts to more equitably balance its activities, but the company's contract with the state emphasizes cost-effectiveness from a state-wide perspective, which favors improvements on O'ahu over relatively harder-to-reach customers on neighbor islands.[56] Over time, the efforts of the Public Benefits Fund Administrator (PBFA) on Hawai'i Island should be expanded, either through continued collaboration with the PBFA and local stakeholders, including the County, or if necessary, adjustments to the PBFA's contract to encourage less subsidization of energy efficiency improvements on O'ahu by Hawai'i Island ratepayers.

Net-Zero Building Construction

While retrofits to existing buildings are essential to improving energy efficiency on the island, the County should also proactively ensure efficient design techniques are incorporated into new construction. Building codes and standards are effective policy mechanisms for improving energy efficiency as the island continues to develop.

The long-term goal is to achieve "net-zero" energy buildings, which use a combination of energy efficient design and renewable energy technologies that allow a building to produce at least as much energy as the building consumes, on average, over the course of a year.

Demand Response

Demand response programs are commonly used by electric utilities to improve the control and operation of power systems. Typically, these programs involve payments to utility customers to reduce or eliminate electric loads when requested by the utility. This can be particularly valuable in the evening and during holiday weeks when the load is peaking on the system (as a way to avoid utilizing inefficient "peaker" units).

Hawaiian Electric Company has developed pilot demand response programs on Oahu and Maui for the past several years, but has declined to expand the

program to Hawai'i Island. Demand response programs are well-established and effective management tools that should be implemented by Hawai'i Island's electric utility as well.

Power System Efficiency

The island's existing petroleum-fired electric generators are only about 32% efficient on average, which means that renewable technologies not only displace kilowatt-hours of electricity, they also eliminate the need for large amounts of imported petroleum products used in conventional generation. HELCO has already taken steps to improve the efficiency of some of its generating units (for example, the Keahole diesel power plant incorporates a separate steam turbine that captures waste heat to generate additional electricity). However, the other major baseload generators (Hill, Puna, and Shipman units) are now between 38 and 57 years old, approaching or exceeding original design specifications.[57] In addition, there are physical limits to how efficient any petroleum-based generator can become, regardless of technological improvements. Replacing petroleum-based generation with renewable generation that does not require combustion of large quantities of liquid fuels, combined with eliminating grid losses, could save some or all of the fuel HELCO purchases each year (more than $120 million in 2011), and would decrease the total energy needs of the island by nearly 24%.[14] Therefore, one important aspect of the energy sustainability transformation process is the retirement of aging, inefficient electric generators with modern, advanced renewable power sources.

Deploying Low-cost Renewable Electricity Generation

In the past, the high capital cost of renewable technologies did not compare favorably with the relatively low prices of petroleum products. The existing energy infrastructure was already based on petroleum and other fossil resources and replacing it was infeasible and uneconomical.

Recently however, the costs of some renewable electricity technologies have been declining rapidly. For example, over the last six years, retail electricity costs have risen more than 40%, while solar photovoltaic panel costs have fallen dramatically, more than 20% in 2011 alone.[58]

As a result, many renewable energy technologies have matured to the point that they can now compete with current electricity prices, which is sometimes referred to as grid-parity. The levelized cost of renewable generation technologies available in Hawai'i, which is a calculation of the average cost over the life of the technology, including operations and maintenance, now range from $0.07-

0.27/kWh.* In most cases this is lower than the average cost of petroleum-based generation of $0.24/kWh, and significantly lower than the retail electricity price, which reached $0.42/kWh in 2012 (the retail cost of electricity is higher than the generation cost because the retail cost includes transmission and distribution, power system operation, administrative expenses, taxes, and utility profits).[2]

The relatively low cost of renewable electricity provides a powerful market signal, but it has not been sufficient to induce widespread adoption of renewable energy in the electricity sector. Technical challenges associated with interconnecting renewables into the current power grid, as well as policy and financial incentive issues, have prevented a full transition to renewable electricity.

Technical Challenges to Interconnection and Grid Operation

There are a number of engineering challenges associated with accommodating new renewable generation into the current power system. Conventional power plants have the capability of producing a steady source of electricity, known as "firm" power. Some renewable energy sources, such as wind and solar, are not firm because they depend on the variable availability of the natural resource. Geothermal energy can be considered a firm resource, as can biofuels or biomass burned in a conventional power plant, so these technologies do not face the same interconnection challenges as wind and solar.† Wind and solar resources can be augmented with a number of commercially available technologies to give the power more "firm" characteristics, improve the quality of the power, and provide essential grid support services. Nonetheless, HELCO has expressed concerns about accepting new variable generation on technical grounds.

The technical issues with interconnecting variable renewable energy sources into the existing electric power system can be thought of as overall, "system-level" challenges, and more localized, "circuit-level" challenges. At the system-level, the current power grid is not designed to integrate fluctuating electricity generation sources because the power system is designed to precisely match electricity demand (customer loads), which are not currently controlled by the utility, with a finely tuned *supply* of electricity from controllable, predictable generation sources. The current power system was designed to accept demand unconditionally and respond with quick control over the supply of electricity, increasing or decreasing power, and matching it perfectly with demand every second of the day. The system operator currently relies on well-established generation technologies like steam turbines and diesel generators to follow customer load throughout the day and

* Levelized costs include capital and operations and maintenance expenditures over the expected life of the particular technology.

† Ocean thermal energy is another long-term possibility for a "firm" renewable resource but is not yet commercially available.

provide support to the transmission and distribution system (including ancillary services for system stability). Fluctuating wind and solar resources make balancing supply and demand moment-to-moment more difficult, and the inability to adequately maintain this balance could result in instabilities in the power system, equipment damage, or potentially a cascading system failure.

There is also a set of "circuit-level" challenges, which are related to another aspect of the current design of the electric power system, which is intended to support customer loads through generation of large amounts of electricity at centralized locations.* According to this design, the energy is pushed out to customers throughout the island through the transmission and distribution systems. The system is not designed for energy to come pushing back from distributed solar panels. The utility has advocated for significant limitations on distributed renewable energy due the challenges facing the system operator in integrating the distributed resource into the traditional power system. The utility has worked with stakeholders and experts through Public Utilities Commission dockets to examine and address these issues.

Modernizing the Power Grid

The current electric power system was built over the last 100 years with a centralized design common to most mainland systems. However, the inadequacy of this design for meeting current and future needs has prompted both the US Department of Energy and the Federal Energy Regulatory Commission to encourage the nation's utilities to invest in what they call the "smart grid" – a massive modernization of the country's electric power system. The smart grid is intended in part to help the power system operator more efficiently utilize variable renewable sources. Certain smart grid applications will allow for more fine-turned control over both supply and demand of electricity, making it easier for the system operator to integrate variable sources onto the grid.

Many smart grid technologies have been commercialized and have proven their value to utilities and their customers. Some of the most promising technologies for the smart grid have not yet been fully evaluated. However, there are large-scale demonstrations (involving millions of customers) occurring throughout the United States.

* This is a simplification of the many distribution system issues associated with distributed generation. However, this general example serves to illustrate the difference between two scales of the interconnection challenge.

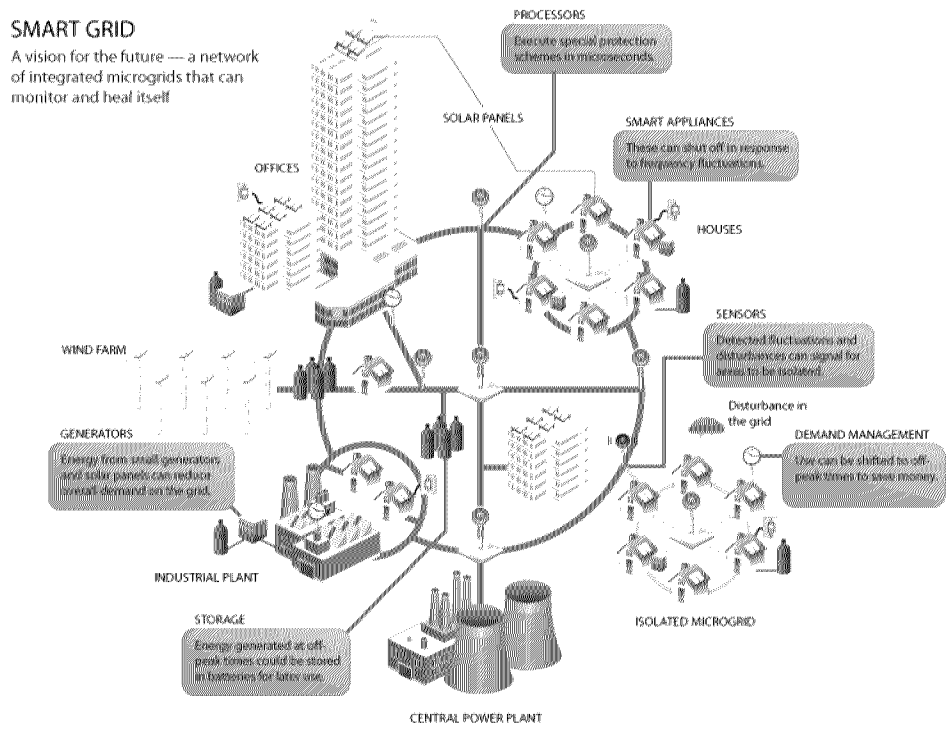

FIGURE 38. ONE VISION OF A SMART GRID SYSTEM[59]

Hawaiian Electric Industries has invested in smart grid projects on O'ahu and Maui, including a $37 million partnership with Japan, as well as several other smart grid pilot and demonstration projects on those islands.[60] Kaua'i Island Energy Cooperative has routinely been celebrated for its smart grid projects. However, there are no similar pilot projects on Hawai'i Island. HELCO has stated it will consider smart grid projects after demonstration and pilot projects have been conducted on other islands in the state. However, the usefulness of these other demonstrations may be limited due to the significant differences in the power systems of Maui, Kaua'i, and Hawai'i Island. Rather than continue to stand on the sidelines, Hawai'i Island should deploy these commercially available smart grid technologies to modernize the island's power system, enable the maximum deployment of renewable electricity on the grid, and lower electricity generation costs to ratepayers.

COMMUNITY ENERGY SYSTEMS AND MICROGRIDS

A microgrid is an electricity generation and distribution system that covers a relatively small area and number of users that is able to function partially or completely separately from the larger power grid. Inside a microgrid, generation facilities are sited close to the end users and will often produce only the power needed by those users without much interaction required with the larger grid. In order to achieve these functions, a microgrid requires its own independent control and management system.

A community energy system can be thought of as simply a microgrid designed to serve the needs of individual communities. Because they are somewhat isolated, community energy systems offer an opportunity to bring more distributed renewable generation to the island than the current grid is designed to handle. This can increase the security of energy for the community served by continuing to function and deliver reliable electricity even if the larger grid cannot. Community energy systems may also increase the security of the overall electricity system because each individual community energy system can operate independently of the larger grid and can provide stable, resilient power to support the island's power system in times of need.

The technologies for developing microgrids in local communities across Hawai'i Island are commercially available today, but in the United States industry standards are still under development and the state's regulatory structure does not easily allow for their construction or operation. The US Department of Energy is collaborating with industry experts and electric utilities to deploy microgrids at several different locations on the mainland. Two prominent examples are the microgrid system at the University of California – San Diego (a 42 MW system),[61] and the microgrid serving the Santa Rita Jail in Alameda County (a 3 MW system).[62] Both of these systems are expected to save their owners more than $100,000 per year in energy costs. However, changes to state law or favorable decisions of the Public Utilities Commission are necessary to facilitate deployment of community energy systems in Hawai'i.

There are several policy tools that should be considered to spur additional investment in community energy systems. Retail wheeling, which refers to the delivery of electricity generated in one location to a customer or customers in another location, is not currently permitted in Hawai'i, but is a common aspect of the electricity markets on the mainland. The natural monopoly characteristics of electric power transmission systems make it inefficient to force renewable energy generators to build duplicate transmission systems alongside the existing network built and owned by the incumbent utility. Typically, energy producers who wish to sell electricity directly to third parties must pay a fee to the transmission/distribution utility in exchange for permission from the utility to "wheel" power across the existing network.

The PUC has considered instituting a wheeling policy (though it has so far indicated it is only willing to consider wheeling between government agencies or departments, not for the general public—see Docket #2007-0176 in Major PUC Dockets, above). Without permission to wheel power over the existing network, a renewable energy producer would be required to apply to the state to operate as a regulated public utility, in addition to constructing its own transmission network. The administrative costs of becoming a regulated public utility and the construction costs of duplicating the existing transmission network present

formidable challenges to accessing renewable energy resources and delivering energy to directly to customers. Wheeling allows renewable energy producers to efficiently reach customers while fairly compensating the electric utility for use of its transmission and distribution system.

Another major policy tool used in several mainland states allows community members to pool their resources to install renewable energy projects and share the benefits. These programs have different names depending on the state (for example, "community-shared solar", "virtual net-metering", "community choice aggregation", "solar rewards", etc.) and can vary in their implementation details, but fundamentally allow individuals who may not be able to install a rooftop solar system for legal, technical, or financial reasons, to nonetheless reap the benefits these systems can provide. Several states across the country have some version of this concept, which typically requires changes to state law. A similar program for Hawai'i Island would allow communities to increase disaster resilience, improve reliability of energy supplies, and lower electric bills to customers who may not be able to otherwise afford the upfront investment required to purchase their own system. Such a program could also allow those without adequate rooftop space, such as renters and condominium owners, to enjoy the benefits of renewable energy.

Electricity Market on Hawai'i Island

The electricity market on Hawai'i Island is currently a monopoly controlled by Hawaiian Electric Industries, Inc. through its subsidiary Hawaii Electric Light Company (HELCO). HELCO has a franchise for electric utility service granted by the State of Hawai'i. HELCO generates just under half of the electricity delivered to its customers (about 46%);[111] the rest is purchased under contract from independent power producers, including from geothermal, wind, hydro, and petroleum sources. Despite the utility's reliance on independent power producers for electricity generation, HELCO is the only utility providing retail electricity service on the island. Interconnection to the power grid is almost entirely controlled and determined by HELCO.

Hawai'i Island has vast energy resources, but a third-party is not permitted to generate electricity and sell it directly to end users using the existing power system. As described above, in Hawai'i the utility has no obligation to allow "wheeling" of electricity because there is no competitive retail market.

Access to the Island's power grid is controlled and determined by HELCO, subject to regulation by the PUC.

As a result, there are a limited number of possible ways to generate renewable energy and obtain permission from HELCO to interconnect to the island's power grid. For large projects, a specific agreement with HELCO is typically required.

However, HELCO has sufficient generating capacity to meet current demand, so the utility does not need to actively solicit new generation. The Feed-in-Tariff (FIT) is a new option for smaller, distributed renewable energy. The FIT offers a standardized contract and guaranteed payment rates, which are attractively priced for different renewable technologies. The FIT is one of several policies designed by the Public Utilities Commission to increase the amount of renewable energy interconnected to the grid throughout Hawai'i; however, HELCO still retains final approval (subject to appeal to the PUC) over any particular interconnection request, and is permitted to deny projects that in the opinion of the utility would compromise reliability.

Role of Government Regulation

In the State of Hawai'i, the importance of the design and implementation of government regulation of the electric power industry cannot be overstated. All stakeholders, including those in government and the private sector, respond to the incentives established by energy policy and regulation.

Existing government policies and regulations in the electricity sector provide financial incentives to preserve the status quo and limit renewable energy integration.

Despite official renewable energy goals, under current regulations and rate structures, HELCO has an incentive to continue to produce electricity with its own oil-fired generators. The utility is not permitted to make a profit on purchased electricity, nor may it profit from expenses related to purchasing fuel. These costs are passed directly to customers. The utility is entitled to a return on investments in power plants and the operations & maintenance expenses associated with operating its facilities. Therefore, as renewable energy additions reduce the need for utility-owned generating facilities, the utility will lose assets on which it can earn a return and the company may see falling profits when purchasing renewable energy from third parties instead of operating its own facilities.

Certain policy changes have been implemented to address these kinds of misalignments (revenue decoupling is the most significant example). Nonetheless, powerful financial incentives to preserve the status quo and block renewable energy integration remain embedded in the regulatory system.

This situation highlights a fundamental reality of the electric power industry on Hawai'i Island: the regulatory system will shape the energy future of the island. When the regulatory system encourages certain investment decisions and penalizes others, the utility and other stakeholders act accordingly. In general, the regulatory system needs to be designed to encourage the kinds of investments required to transition the island's energy system to sustainability. There have been significant changes in energy policy since the Hawai'i Clean Energy Initiative

began in 2008, and PUC continues to consider broad regulatory adjustments to accelerate the state's transition to clean energy. However, so far, these changes have not yet resulted in substantial additions of renewable energy on Hawai'i Island.

> In Hawai'i Island's highly regulated electric power industry, government policies will shape the energy future of the island.

The electricity market is also influenced by broader state and federal energy policies, though these impacts are more blunt and less direct than polices of the Public Utilities Commission. The primary instrument of state energy policy is the Department of Business, Economic Development, and Tourism (DBEDT). Under Hawaii Revised Statutes §196-3,the director of DBEDT is, by law, the state's energy resources coordinator. The administrator of the State Energy Office (SEO) reports to the director of DBEDT.

Federal energy policy is felt primarily through the various offices and laboratories of the Department of Energy.* In addition, the US Pacific Command is headquartered on O'ahu, with additional facilities on many islands. The substantial military presence in the state gives the Department of Defense significant influence on energy decisions throughout the state.†

Risk and Reward

Current rate design assigns the risk of rising petroleum prices entirely to utility customers.‡ Because its customers bear the risk of rising prices, the utility's incentive to eliminate its petroleum dependence is reduced. Revenue decoupling, a policy recently approved by the PUC, similarly assigns the risk of falling electricity sales and rising operations & maintenance expenses to the utility's customers.

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* There are important limitations to the application of federal energy policy in the State of Hawai'i due to the isolation of the state from the mainland and the lack of interstate commerce in the electricity market. For example, parts of the Federal Power Act, which include provisions governing transmission of electricity, wholesales rates and charges, and interconnection requirements, do not apply in Hawai'i. However, amendments made under the Public Utilities Regulatory Policy Act (PURPA) are based on the police power of the US Constitution, so they do apply in the state.

† The Department of Defense has aggressive renewable energy targets, and has invested in microgrids, fuel cell vehicles, solar power, ocean thermal energy conversion, and biofuel projects throughout the State of Hawai'i.

‡ The Energy Cost Adjustment Clause is a mechanism that automatically adjusts electric rates based on the cost of fuel used for electricity generation. There is no cost-sharing between the utility and its customers, despite state law which requires that utility rates "fairly share the risk of fuel cost changes between the public utility and its customers." (HRS § 269-16(g))

Another key issue is the financial penalty imposed on the electric utility when accepting interconnection of new renewable energy. * HELCO passes on purchased electricity costs to its customers; no profits can be made on electricity the utility does not generate on its own. Therefore, the utility has an incentive to sell its own electricity, in order to justify investing in its generation facilities. HELCO has contracts to purchase electricity from independent power producers, and its own facilities are capable of producing 50% more power than the island ever demands. In addition, HELCO is ultimately responsible for the safe operation of the power system, so the company understandably favors keeping its own generators online, which can result in curtailment of other renewable resources instead.†

Because customer loads have not been increasing in recent years, adding new generating sources (including customer-sited solar panels) requires existing sources to be displaced. Despite this apparent contradiction with financial incentives, the utility is actively pursuing new large-scale renewable generation from independent suppliers in part to satisfy the state Renewable Portfolio Standard and other policy goals.

The Impact of Avoided Cost Contracts

In 2011, HELCO purchased 37% of its electricity from independent power producers generating electricity from renewable sources.[11] However, the island's renewable electricity production does not provide a hedge against rising, volatile petroleum prices because the energy supply contracts between HELCO and the independent power producers are almost all tied to the price of oil, known as the utility's avoided cost of energy. The existing contracts do not expire until between 2021 and 2027, so the utility will continue to pay a premium for existing renewable generation for many years (paying high avoided cost prices for relatively low cost renewable electricity was previously required by law but is now no longer permitted in most cases). Reducing overall electricity costs by taking advantage of the low cost of renewable electricity generation will require adding relatively large amounts of new renewables to displace existing petroleum-based generation.

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* The utility is legally obligated to allow customer-sited solar under the net energy metering (NEM) and feed-in-tariff (FIT) provisions. However, HELCO has exceeded state standards regarding overall integration of renewable energy because the utility already purchases 31% of delivered electricity from Puna Geothermal Venture, the two wind farms, and several hydroelectric operators, so meeting state law does not provide a compelling financial incentive to integrate additional renewable energy.

† Besides the financial penalties for favoring IPP energy over its own generation, HELCO does not have systems in place for perfect operational control over IPPs, nor does the company control how well the IPPs are maintained, so the utility is reluctant to rely on those facilities to provide essential grid support services.

RENEWABLE ELECTRICITY OPTIONS

GEOTHERMAL

The most recent estimates put the island's geothermal resource at 1,396 MW (most likely) or 488 MW (minimum) technically recoverable reserve, which far exceeds the 2011 island-wide peak load of 189.2 MW.*[63] It should be noted that estimates of the geothermal resource are imprecise due to the limited geothermal exploration that has occurred to date. The Kilauea East Rift Zone, where the current geothermal power facility is located, is currently the only proven resource on the island. The Puna Geothermal Venture facility currently has a capacity of 41 MW (of which 38 MW is contracted to HELCO). The facility is permitted up to 60 MW, but would need permission from HELCO to interconnect more than its current 38 MW into the utility's power grid.[64]

Other areas on the island that have been identified for geothermal potential include the Mauna Loa Southwest Rift Zone and the Hualalai West Rift Zone (Figure 39). These resources are not proven and no new projects have been formally proposed for the island. It is also important to note that these areas are the most volcanically and seismically active regions of the island, which could pose a risk to any infrastructure development.

The current County and State administrations have both supported the pursuit of geothermal development as a critical component of energy sustainability for Hawai'i Island. To this end, HELCO issued a request for information for a 50 MW geothermal plant in 2011 and received authorization with Decision & Order 30360 in docket #2012-0092 to proceed with drafting a more specific request for propsals from the Public Utilities Comission in May 2012. The Integrated Resource Planning process (to be conducted in 2012 and 2013) will likely evaluate future additions of geothermal energy to the power system.

The Geothermal Working Group was created by the County of Hawai'i in reponse to Senate Concurrent Resolution 99 in 2010. The purpose of the Working Group is "to analyze the potential development of geothermal energy as the primary energy source to meet the baseload demand for electricity on the Big Island." As outlined in its final report in 2012,[64] the Working Group found that geothermal energy has the potential to be "the cheapest form of baseload power for Hawai'i County" while also having a lower environmental impact than conventional power generating facilities. While generally supportive of geothemral development, the report emphasized a need for ongoing attention to public safety, environmental, and community concerns while recognizing that impacts are site-specific. The

* The estimates prepared by GeothermEx describe the technical reserve, which takes into account the characteristics of the temperature reservoirs and the likely technical ability to bring the heat to the surface and produce electricity. It is not an economic or market assessment.

report specifically recommends further investigation into air quality and noise impacts.

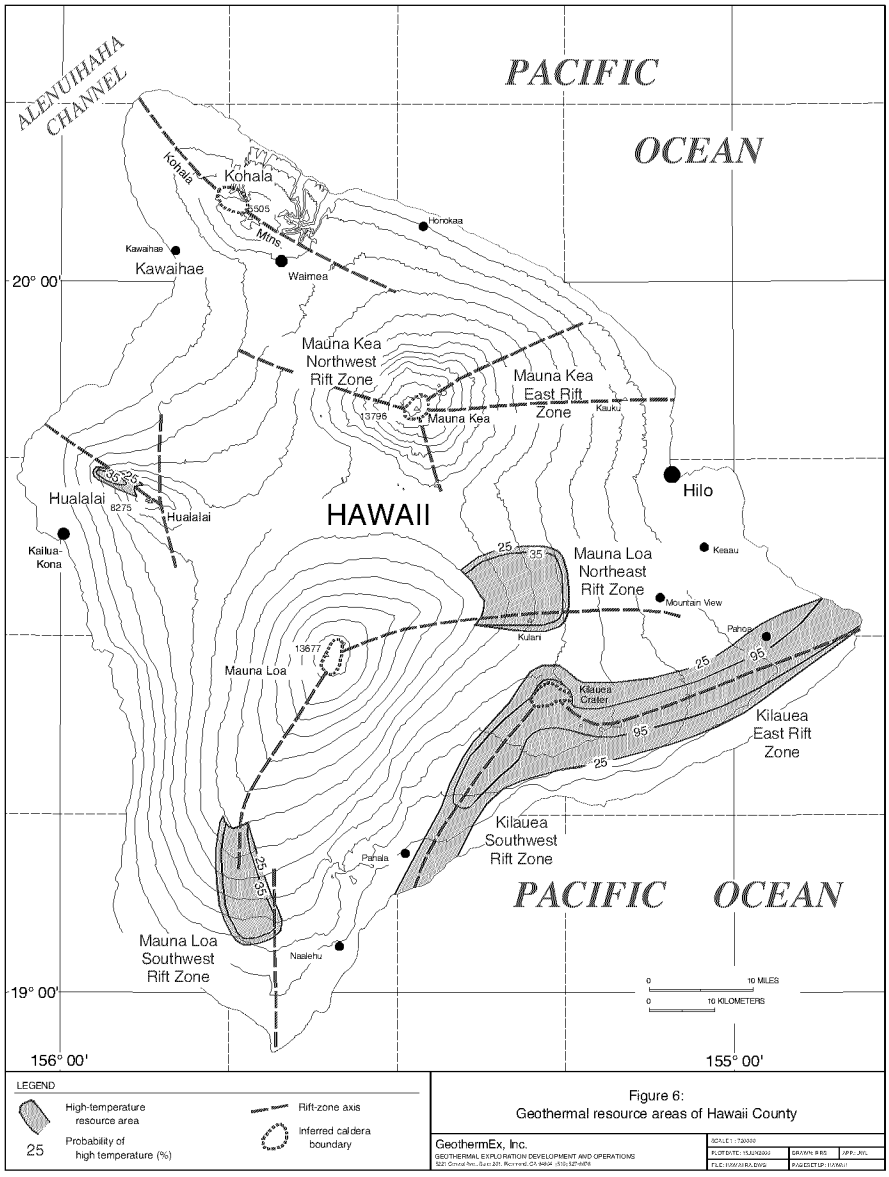

FIGURE 39. GEOTHERMAL RESOURCE AREAS, HAWAI'I ISLAND[63]

Geothermal is one of the least expensive renewable energy technologies, and it also provides a "firm" baseload electricity production, which can be adjusted by the system operator to match variable renewable resources (such as wind and solar generation), enabling their safe integration into the power system. However, geothermal exploration is expensive and time consuming, so any new projects will take several years to complete. In addition, some island residents living near the

existing PGV facility report health impacts from the plant's emissions.* Island residents may object to new proposed development on health, environmental, cultural, or religious grounds. As with all energy development, the impacts of proposals that may be made should be rigorously evaluated by the County on a project-specific basis.

WIND

The trade winds provide the island with a significant, relatively productive wind resource. The capacity factor for the existing wind farms approaches 75% for several months of the year, and averages more than 65% at the Ka Lae site.[11] This compares favorably with mainland wind farm capacity factors typically ranging from 25-35%.[65]

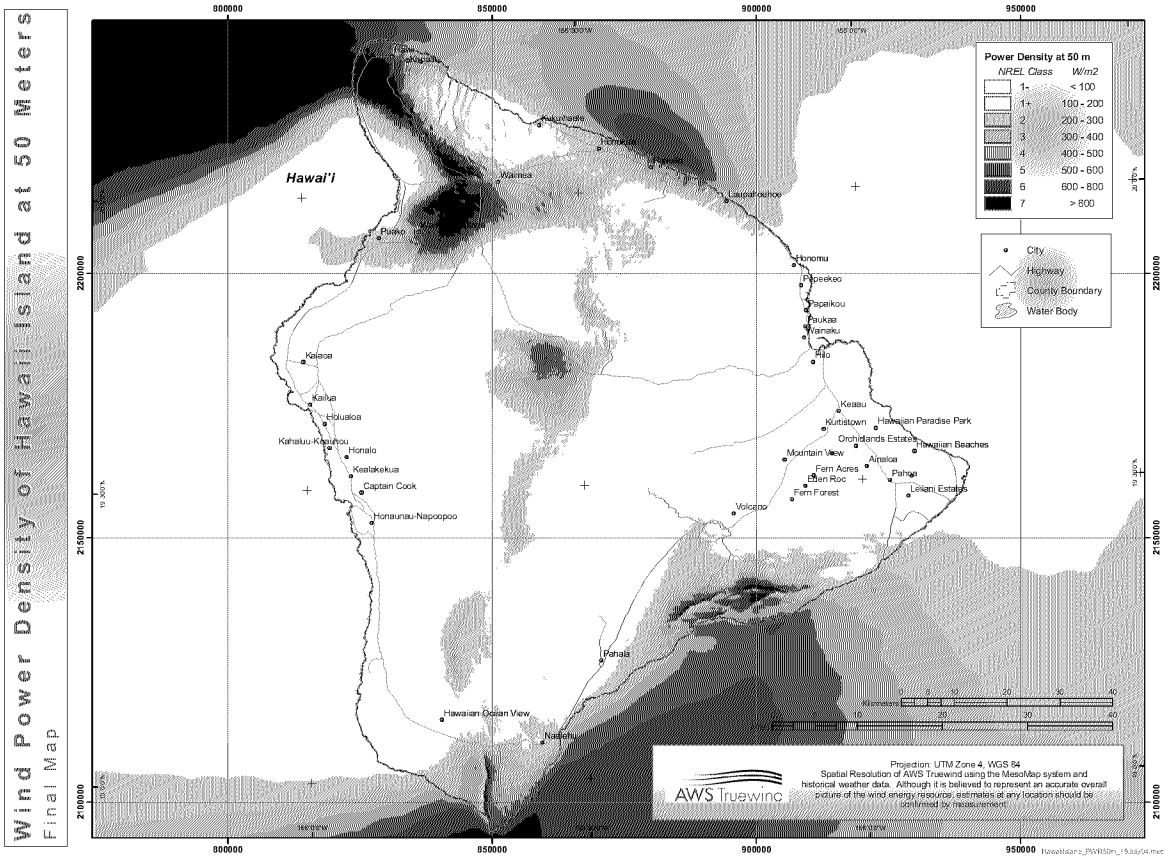

FIGURE 40. HAWAI'I ISLAND WIND RESOURCE POTENTIAL[66]

* These reports have not been scientifically documented. Ormat, Inc., the owner of the PGV facility, states the plant uses a closed-loop technology to limit emissions. The State of Hawai'i Department of Health states the facility does not harm human health and has granted Ormat an operating permit.

A study prepared in 2008 by the Hawai'i Natural Energy Institute of the University of Hawai'i, in collaboration with engineers from HELCO and General Electric, Inc. estimated that 85 MW or more of wind generation could be safely integrated into the island's power system (the potential resource is almost certainly far larger), along with adjustments to current operating procedures.[37] Nonetheless, HELCO has subsequently resisted any new wind generation, with the effect that no serious proposals have been made public.

Solar

Many locations on the island receive abundant sunshine throughout the year, though in general, the Kona side of the island has a more favorable solar resource. The potential of utility-scale solar facilities have not been examined in any publicly available assessments, but the National Renewable Energy Laboratory conservatively estimates there is more than 200 MW of rooftop solar PV potential on existing buildings throughout the island (more than current peak load of 189.2 MW).[12]

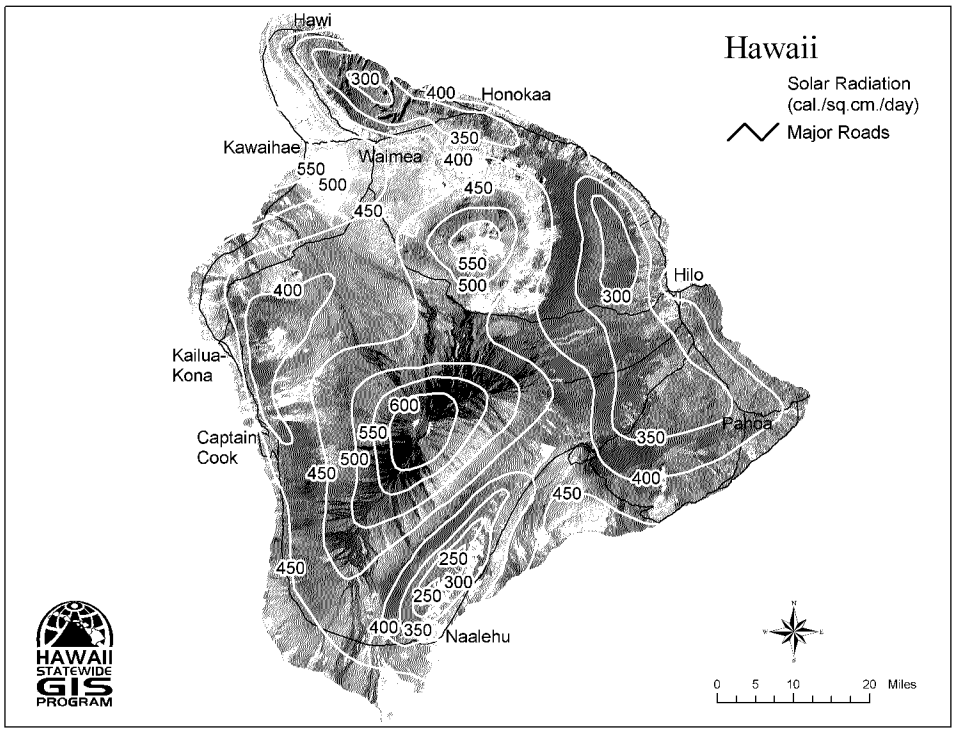

FIGURE 41. HAWAI'I ISLAND SOLAR INSOLATION MAP[68]

A 2005 study prepared by the engineering firm Black and Veatch for Kaua'i Island Utility Cooperative cited an estimate that a 730 acre solar PV installation in the Poipu area on that island could produce more than 500 GWh per year[67] (a little less than half the total electricity sales on Hawai'i Island). The Poipu area receives solar insolation at a rate exceeding 500 cal./cm^2/day, which is relatively high.

However, a large swath of land on Hawai'i Island's Kohala coast exceeds this level of solar insolation, indicating it is likely Hawai'i Island could easily meet its total electrical energy consumption through utility-scale solar PV installations alone.

However, there are several important engineering challenges to integrating solar generation into the existing power system. The effect of these challenges is that the amount of solar PV that can be safely integrated must be evaluated on a circuit-by-circuit basis, so developing an estimate of the technical potential of the island is difficult without detailed data regarding the existing power system. Though this data exists, HELCO considers it to be confidential and does not make it publicly available.

HELCO currently limits the percentage of variable generation permitted on individual distribution circuits before requiring more costly interconnection requirements studies. The "15% rule" is a guideline borrowed by HELCO from the California Public Utilities Commission. According to the guideline, solar PV capacity on a distribution circuit should not exceed 15% of that circuit's peak load. The 15% rule is an extremely conservative estimate that was thought to ensure that no safety or reliability problems would be presented by interconnecting solar PV facilities into the distribution system.[69] A blanket 15% of peak load restriction would allow no more than about 30 MW of distributed solar PV from interconnecting to the island grid (there is already more than 11.2 MW of distributed solar PV on the grid).

In 2011, the PUC ordered modifications to HELCO's Rule 14-H (which governs interconnection into the distribution system) intended to relax this requirement. Now up to 50% of the minimum recorded daytime load can be accommodated on each distribution circuit without triggering an interconnection requirements study. However, there is still a fundamental technical limitation to distribution-level solar PV for the island (still amounting to relatively low penetration of solar), which can probably only be resolved through smart grid improvements and energy storage investments.

Hydropower

All of the existing hydropower facilities are run-of-river units located along the Wailuku River on the east side of the island. The current combined capacity is 16.5 MW. The total hydropower resource potential is small compared to the large geothermal, wind, and solar resource estimates. However, the possibility of a pumped-hydro energy storage system has been studied as an alternative to enable high levels of renewable energy integration (see Energy Storage, below).

Ocean Energy

Ocean energy technologies are not yet commercially available, but there is interest in developing renewable energy from ocean thermal, wave, and tidal

sources. An ocean thermal demonstration project has been underway for many years at the Natural Energy Laboratory of Hawai'i (NEHLA) at Keahole Point, a partnership developed between Lockheed Martin, the defense contractor, and the US Navy. In addition, NELHA has recently announced a new 1 MW demonstration project to be constructed by OTEC International.[70]

Technology experience indicates a 100 MW facility is the most likely optimal facility size, but this could cost around $1 billion today,[71] so current research is focused on increasing the efficiency of heat exchangers used in the thermal conversion process.

Estimates from the US Department of Energy suggest the wave and tidal ocean resource is also extensive (at least 85 TWh per year—see Table 8), far exceeding state-wide electricity needs, but the technologies for capturing these resources are less developed than ocean thermal applications, and will take some time to become commercially available in Hawai'i.

Bioenergy

Bioenergy for electricity can be harnessed through combustion of biomass (for example, wood chips, certain grasses, etc.) or through refining plant oils (or waste cooking oils) into biofuels, which are subsequently burned. Biomass combustion is one of the oldest renewable energy technologies deployed in the State of Hawai'i. For decades, the sugar plantations would burn bagasse (cane byproduct) in order to generate heat and electricity for mill operations. Excess electricity was sold to the surrounding communities, which led to the first electric utilities, a development that occurred on Hawai'i Island beginning in the late 1800s.[72]

The last sugar company on Hawai'i Island closed operations in 1996, but there are significant former sugar lands that have been planted with eucaplytus trees, which were intended to reduce erosion and one day be sold for timber or electric power generation.[73]

Hu Honua, a company that controls the old sugar mill at Peepeekeo, has signed a contract with HELCO to produce 21.5 MW of power through biomass combustion.[74] The proposed 20-year contract has not been approved by the PUC, and the company has not indicated if it will use feedstock from Hawai'i Island exclusively, or if it will also require imported feedstock.

Energy Storage

Energy storage can provide important benefits by increasing the flexibility and responsiveness of the power system and helping to safely integrate variable renewable resources such as wind and solar. In 2004, HELCO commissioned a feasibility assessment of a pumped-hydro energy storage system for the island.[75] This study concluded that such a system could feasibly be constructed at a number

of locations on the island, including in North Kohala near Hawi, at Kahua Ranch, in Waimea, and near Waikoloa village.

Locations at the southern end of the island were not considered good candidates due to the lack of existing water supply infrastructure. However, it may also be economically feasible to construct a pumped-hydro energy storage facility using other DWS infrastructure not considered in the HELCO feasibility study.

Other forms of energy storage could include battery-based systems comparable to the utility-scale storage attached to wind farms recently constructed on Maui and O'ahu. HELCO is currently testing smaller battery storage systems at the West Hawai'i Civic Center and at the Hawi Renewable Development wind farm at Upolu Point. Of course, many households on the island are not connected to the power system and already rely on battery storage to complement distributed solar, wind, hydro, and diesel generation systems. Data on off-grid systems are not publicly available, but according to anecdotal accounts, possibly as many as 10% of households are already off-grid (possibly more than 5,000 households).

Waste-to-Energy

Waste-to-energy can take many forms, including digester and incineration technology options. The City and County of Honolulu owns a 46 MW municipal solid waste incineration facility on O'ahu that is currently being expanded to 73 MW. The plant is operated under contract by H-Power (Covanta Energy), and the current design can process 2,160 tons of waste per day.[76]

Both the County of Hawai'i and the County of Maui have investigated the possibility of exploiting their respective waste streams to generate electricity, though the waste streams for the smaller islands are correspondingly less attractive to developers who require steady accumulation of waste in order to economically produce energy. Most recently, Maui County released a request for qualifications from waste-to-energy developers in 2012, which received more than 70 responses.[77] The Hawai'i County Council rejected a $125 million waste-to-energy project in 2008, leaving the County's waste management problems unresolved.[78] The landfill in east Hawai'i is nearing its capacity limit, so the idea of harnessing the waste for energy has re-emerged.

For Hawai'i Island, the main challenge is ensuring a sufficient quantity of waste to make the waste-to-energy facility economically viable. The relatively small amount of waste generation and geographic distribution of waste collection throughout the island means that waste will likely need to be consolidated in one location. Another potential challenge is competition for certain types of agricultural waste, some of which is currently reused by farmers for fertilization and other uses. Smaller scale waste-to-energy projects may become more viable in the future, but most existing technology options rely on concentrating the greatest waste stream possible in order to improve project economics.

The Role of the County of Hawai'i

Most of the planning and decision-making for the island's energy system occurs at the state-level in Honolulu, either by the state legislature, the Public Utilities Commission, or by O'ahu-based Hawaiian Electric Industries, the owner of HELCO and the island's electric power system. Significant state-level influence extends even to the transportation sector (more than one third of public roadways are state-owned), where the County government traditionally plays a large role. The County's authority and jurisdiction is limited to certain specific areas; nonetheless, the County has a critical role to play in facilitating appropriate renewable energy development and leading the island toward energy sustainability. The County of Hawai'i can play a unique role in reducing the island's fossil-fuel dependence by organizing its efforts under three general policy strategies (Figure 42).

FIGURE 42. THREE POLICY STRATEGIES AVAILABLE TO THE COUNTY OF HAWAI'I

Promote Appropriate Energy Development and Use

Just because the County cannot control every energy policy process that affects the island does not mean that it has nothing to contribute. The County can influence the path towards energy sustainability with several important policy tools. The County can facilitate the transition by designing smart policies to encourage appropriate energy development and by using its resources to enable island citizens to obtain lower cost energy projects for their communities. It can directly

affect the energy investments residents and business make through tax policy, incentives, and building codes.

The County can also use quality analysis to help establish informed positions on proposed laws, regulations, and energy development projects. These analyses can also be valuable as a public education tool. In the electricity sector in particular, it is important to ensure appropriate energy development because there is a limited need for new generation capacity and power purchase agreements tend to last twenty years or more.

The County of Hawai'i has a substantial interest in the outcome of state-level energy policy decisions and should advocate for the interests and those of its citizens in critical policy making processes. This will help ensure local impacts are given due consideration by those who control the island's energy system. More importantly, effective participation in state-level decision-making will give a voice to the island in determining its own energy future.

The County currently can only contribute so much, given the limited resources devoted to the energy program. However, energy sustainability issues have come to the fore at the state level and are being increasingly debated, often in parallel legislative, regulatory, and administrative processes. Many complex decisions now being made will affect the County and its citizens for the long term. Municipal and county governments in other states routinely participate in these legislative and regulatory processes in order to protect their interests and the interests of their citizens. Relevant processes include:

- State legislative development and testimony
- Utility rate cases filed with the Public Utilities Commission
- Public Utilities Commission rulemaking dockets
- Hawai'i Clean Energy Initiative Steering Committee
- Hawai'i Energy Policy Forum

County involvement in Public Utilities Commission proceedings is particularly important. On Hawai'i Island, the utility company, its power grid, the associated generating capacity, and the County government are all part of a single bounded system. Other counties in the United States typically do not face the same situation. They are served by large regional grid systems and may not even have a single power plant in their jurisdiction. As a result many local governments are not very involved in utility regulation. Also, mainland counties are unlikely to have a policy goal of achieving energy self-sufficiency exclusively with resources contained within the county. Because of its unique circumstances, the County of Hawai'i has a responsibility to take a proactive role in representing the best interest of the island in utility regulation.

Develop Innovative and Proactive Policy

The County must anticipate the challenges and issues that will arise around exploiting Hawai'i Island's natural resources for energy by using community-supported evidence-based decision-making. The County can be prepared for new project developments by creating rigorous, succinct and comprehensible frameworks for analyzing energy issues in land use planning, permitting, and more generally in discussion of energy issues for the island. Finally, it has substantial leeway in directing the development of the island's transportation infrastructure, including mass transit.

Lead By Example in County Operations

The County of Hawai'i alone spent over $35 million on electricity and fuel in 2011. Most of this ($19M) is spent by the Department of Water Supply on electricity to deliver water to customers.* Even excluding the large Water Supply energy expenditure, government operations required more than $15 million for energy purchases, of which about $7.9 million was used for electricity and $7.5 million for liquid fuels for transportation and equipment.

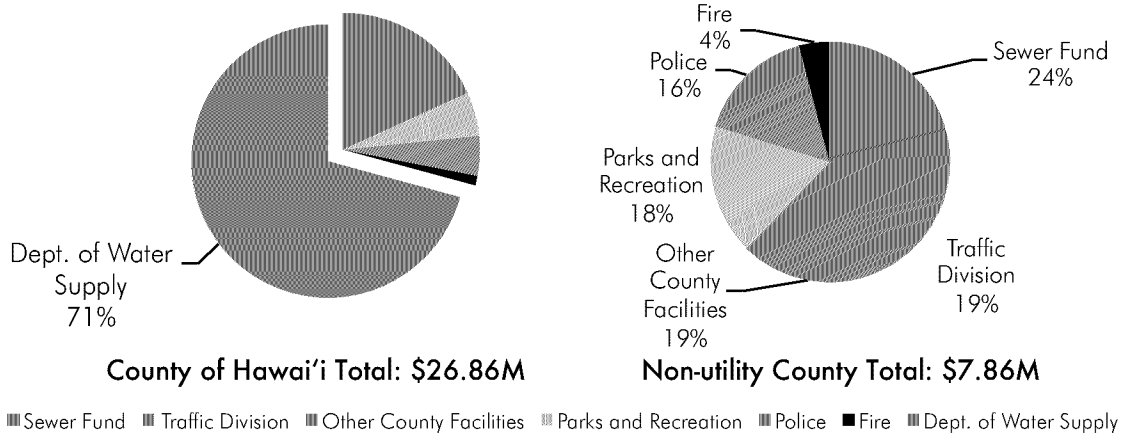

Figure 43. County of Hawai'i Electricity Expenditures, FY2010-2011 *[15,16]*

* The County of Hawai'i Department of Water Supply is a semi-autonomous agency governed by an elected Board of Water Supply. The department's budget, staffing, and decision-making is administered separately from the rest of the County of Hawai'i.

Energy efficiency and renewable energy projects developed by the County for both electricity and transportation can result in substantial savings that more than pay for the cost of installation and operation over the life of the project. These savings can be used to support both energy and non-energy policy efforts of the County.

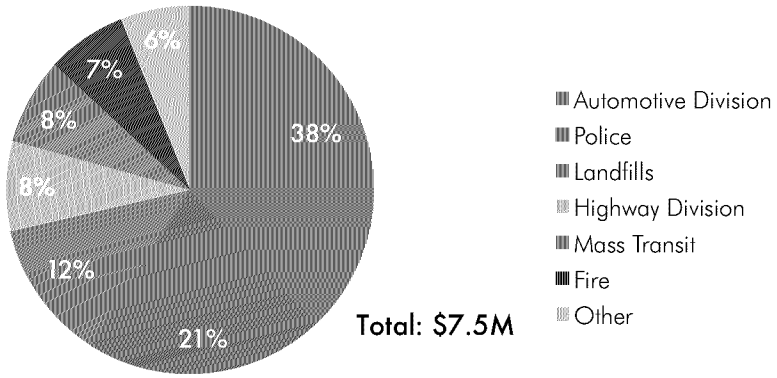

FIGURE 44. COUNTY OF HAWAI'I FUEL EXPENDITURES EXCLUDING THE DEPARTMENT OF WATER SUPPLY, FY2010-2011 [15]

CIVIL DEFENSE AND EMERGENCY PREPAREDNESS

The County of Hawai'i provides essential services to the island that are dependent on energy for their continued operation (e.g., water supply, emergency response, etc.). The Civil Defense Agency oversees the County of Hawai'i's response to emergencies. In the event of an emergency, one of the most basic concerns is maintaining adequate energy supplies in order to coordinate and respond to the situation effectively.

For the Civil Defense Agency and other departments of the County of Hawai'i, ideally there would never be an interruption in energy service, even during an extended emergency situation. Most critical County facilities are currently equipped with diesel generators for backup electricity. The County of Hawai'i should invest in renewable energy systems to improve the resilience of energy supply for essential government services. For example the Emergency Response Center in Hilo could be equipped with a solar array and batteries. Public Safety buildings and key administrative sites throughout the island could be similarly equipped.

Five-Year Roadmap

Overview

This Five Year Roadmap presents a path to save energy costs and support a strong set of energy policies and programs for the County government. It is the practical synthesis of the guiding principles, objectives, and role of the County described in the plan. Over the next five years, the County of Hawai'i should focus on building the internal capacity of the energy program and staff, modernizing County operations and facilities, and developing innovative policies and programs to more effectively lead the energy transition.

The Roadmap has the potential to save nearly $4 million in County operations over the next five years with modest upfront investments. These upfront investments have a simple payback of less than one year.

The Roadmap is not exclusively focused on County operations. In fact, the bulk of the Roadmap focuses on creating policies and programs that encourage energy sustainability island-wide while protecting the best interests of the island's residents and businesses.

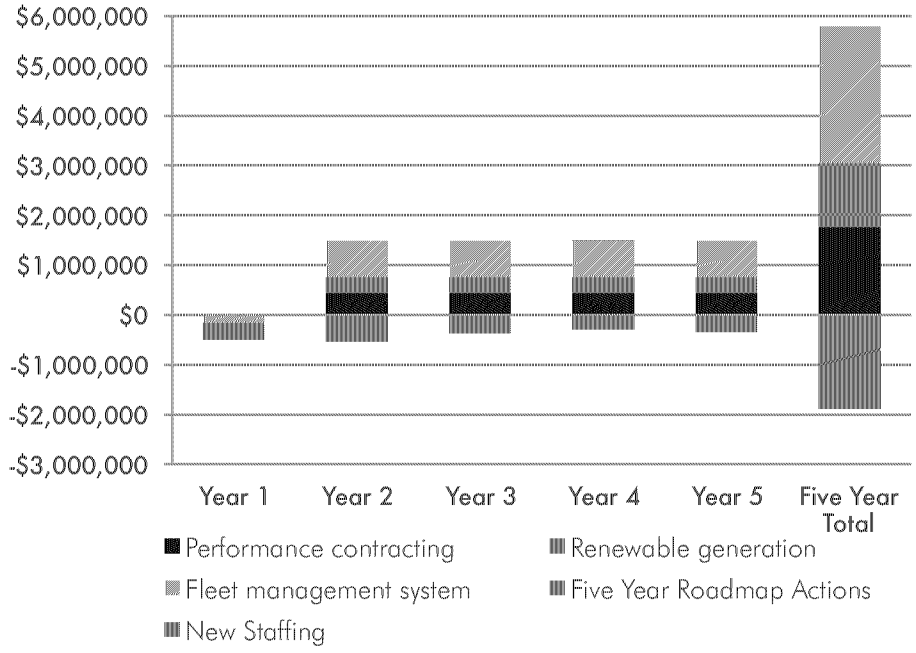

FIGURE 45. FIVE YEAR ROADMAP COSTS AND SAVINGS

There are four subsections of the Five Year Roadmap. The first lays out the role of the County and the general functions of the County's energy program, including required resources. Most importantly, the program should be led by a new County position with the ability to broadly coordinate energy initiatives across departments and represent the island's interests outside of county operations.

The three remaining sections describe a set of specific Priority Actions organized around the areas of Transportation, Renewable Electricity and Energy Efficiency. Within each section the Priority Actions are categorized into one of three general policy strategies available to the County (Figure 42). Although the County's power is limited, these strategies represent the unique role it can play in reducing the island's fossil-fuel dependence.

The Five Year Roadmap presents a brief summary of each Priority Action. The full details of each Priority Action are included in the Complete Priority Action section of the larger plan. The Priority Actions have a common structure, with several recurring elements to make them more easily transferable to implementation. The essential elements are:

- Background information including current County activities, examples of success, and related state policies
- Recommended steps for implementation
- Impact and benefits
- Measuring success
- Authority for action
- Timeline and costs
- An assessment of the available and required resources and responsibilities
- An analysis of the technical and political feasibility and the potential for support or disagreement from the community.

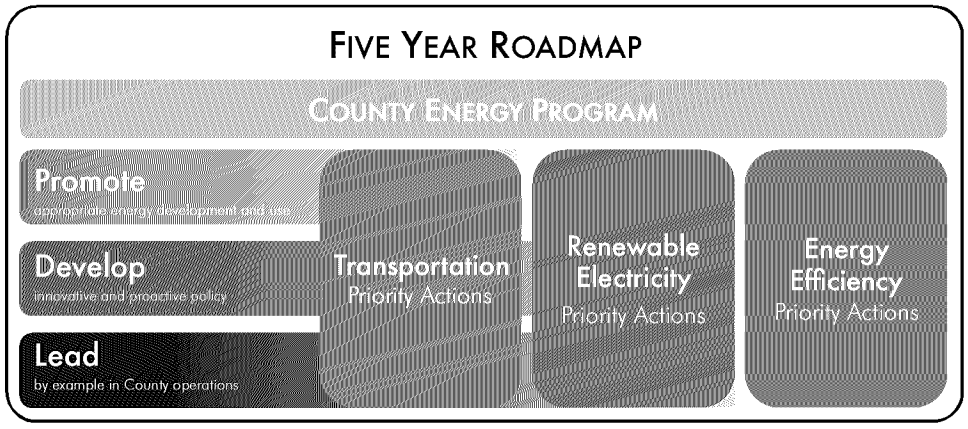

FIGURE 46. STRUCTURE OF THE FIVE-YEAR ROADMAP

THE ENERGY PROGRAM

The County of Hawai'i has the opportunity to build on the many successful energy projects developed in the last few years; however, addressing the island's energy sustainability challenges requires a coordinated and integrated effort from all parts of the County government. The County must allocate sufficient resources to the energy program so the island can continue to lead the state and the nation in reducing dependency on imported energy.

An overview of the resources and general procedures for a new energy program for the County are presented in the following sections, with key recommendations to:

- Create and empower a robust energy program with sufficient resources to provide leadership and coordinate energy initiatives across departments.
- Allocate sufficient funding from energy program savings for these functions.
- Create a system for the accountability of the energy program through consistent documentation and reporting of activities and by restructuring County energy consumption and cost data collection and analysis.

LEADERSHIP AND RESOURCES

A central objective of the Energy Sustainability Plan is to provide not only recommendations regarding energy initiatives but also to outline the resources necessary for execution of those initiatives. Successful implementation of the Five Year Roadmap will require changing the status quo, which in turn requires leadership and political will.

The current County administration has publicly advanced the goal of Hawai'i Island achieving 100% renewable energy by 2015. This, or any, ambitious goal will require a coordinated effort on the part of the County and other key stakeholders. Such leadership requires the Mayor to designate and empower a professional team to plan, manage, and execute energy programs. It also requires the administration to expect cooperation, and where necessary active participation, across all County departments in implementing energy initiatives. Creating a strong and independent energy program would send a clear message that sustainability issues, particularly energy, are a core priority of the County and the current administration.

The energy program should be led by a County energy program manager with the ability to broadly coordinate energy initiatives across departments and represent the island's interests outside of county operations. Past projects have demonstrated that interdepartmental cooperation is essential, such as the successful solar photovoltaic system and electric vehicle program at the West Hawaii Civic Center primarily involving the Department of Research &

Development, the Department of Public Works, and the Department of Finance. The energy program manager would be supported by new and existing positions, the Energy Advisory Commission, and the interdepartmental task force known as the Green Team.

Dedicated and Predictable Funding

Only about $300,000 for the Department of Research and Development's energy programs has been included in the County's FY2012-2013 operating budget as an identifiable line item. This amount is less than 2% of the anticipated energy related expenditures in the County not including the Department of Water Supply. With respect to capital budgets, the County designated approximately $4 million from a recent bond sale towards energy related programs that could result in $3.4 million *per year* of energy related savings.[79,80]

The cost savings generated from renewable energy projects can allow funds to be reallocated to support staff and new projects, but only if the appropriate tracking mechanisms are made part of the budget process. The majority of the savings can be directed to the General Fund to help with any County budget items. However, a "revolving fund" should be set up to capture part of the savings from energy projects to pay for the energy program staff and activities to assure and continue this cost-saving trajectory. The energy program staff should have some responsibility selecting appropriate projects for the revolving fund and for achieving the necessary savings to cover their operating costs. However, state civil service law likely precludes tying employment to achieving savings targets. The County may have other options for a high level of accountability for self-funding.

Accountability

Quality data is necessary for effective decision making for energy programs and projects. Similarly, it is essential for tracking progress such as cost savings. At present, the County does not have a formal system to track, measure, or monitor energy consumption together with costs. Energy expenditures are recorded by the Department of Finance but there is no system of accountability for department heads to monitor and control energy use. This information is not available in the widely published budgets and financial reports of the County, so the public also cannot easily get an understanding of how energy is used or paid for by its local government.

The need for accountability extends to the employees charged with implementing this plan and the energy program more generally. The Five Year Roadmap identifies what data sources currently exist and contains guidelines for measuring success that should be reliably tracked and reported to gauge the success of the energy program.

The Functions of an Energy Program

Energy sustainability is undoubtedly linked to economic development, but because these challenges are far-reaching, their solutions will require the coordination of many aspects of government. A strong energy program would perform six functions in pursuit of Hawai'i County's sustained economic development and energy sustainability goals (Figure 47).

FIGURE 47. SIX FUNCTIONS OF A NEW ENERGY PROGRAM

It is important to note that the role of existing County departments, and the government as a whole, could be described using many of these same words. It should not be the role of an energy program manager to take control of the many important and complex responsibilities of existing departments, since the specialized knowledge, skill, and experience of existing staff are invaluable. Rather, the County's energy program would serve as a resource to other departments and provide leadership in energy policy implementation.

Strategy Development

The new energy program can build from a strong base of existing laws, Council resolutions and strategy documents. Ideally, future planning and strategy development would happen on a specified and reliable schedule as described in Appendix C: Energy Program Planning. The process would also be timed so as to contribute most effectively to other processes such as budget development, legislative calendars, federal grant seeking, the general plan, and transportation planning.

Implementation

The energy program staff should be actively involved in the day-to-day implementation of policies and programs specified in the Five Year Roadmap and existing County plans, specifically the Green Government Action Plan. Major energy related projects should be the purview of the energy program staff (e.g. large solar PV projects on County property). Staff should advise on specific ongoing projects and policies implemented by other departments, by providing research, analytical support, and communication. Tracking the financial

performance of the energy program is paramount, along with seeking new sources of funding through projects and grant writing.

Data Collection and Analysis

There are two primary purposes of data collection and analysis at the county level. First, to ensure the accountability for program success, the energy program would actively collect data to support strategy development, implementation, advocacy, and reporting functions of the energy program. Each priority action recommended as part of the Five Year Roadmap includes a list of potential data indicators to help track its success.

Second, the County's energy consumption and expenditures could be better tracked and therefore improved. Some analysis would occur on regular timelines as discussed in the Energy Program Development and Reporting section, but other projects and developments may require unplanned time-sensitive evaluation.

Advocacy

An important function of the energy program would be to fulfill the County's role of promoting appropriate energy development and use, particularly with respect to state authorities and the legislature. Through the new energy program, the County would also use quality analysis to help establish informed positions on new laws, regulations and private-sector projects being proposed for the island. Public outreach and education is important for many of these processes and can be informed by the analysis conducted by the County.

Reporting

The energy program should go above and beyond the current level of program reporting that occurs in County departments. Energy policy is rapidly evolving and the community is increasingly scrutinizing energy sustainability policy throughout the state. The administration, the advisory committees, the County Council, and the community should all be kept informed of the County's energy-related activities. This plan suggests how and when to evaluate the success of the Five Year Roadmap actions including measurable indicators.

Coordination

It is worth reiterating the importance of the coordinating role of the energy program in addition to the examples mentioned above. Energy sustainability issues affect every department in the County, and a number of current energy sustainability programs already exist. Effective coordination among County staff and department initiatives will reduce cost and build on successes that have already been realized.

Energy Program Resources

In addition to the basic functions of the energy program presented above, implementing the complete set of Priority Actions presented in the Five Year Roadmap will require a small but flexible professional staff. Broader support can be provided by a reconstituted interdepartmental Green Team and a permanent Energy Advisory Commission. The allocation of these resources is mentioned in the detailed discussions for each priority action from the Five Year Roadmap. The recommended energy program resources for the five-year implementation period include two existing positions and three new positions:

- **Energy program manager:** a new position to take the lead in collaboration and coordination across departments and with other energy staff. With a direct line to the mayor, this position would act as the primary voice in strategy, policy, and advocacy documents. An additional role would be to manage the third-party contracts for relevant Priority Actions.
- **Energy Coordinator:** a refocused existing position to support the program head in performing the advocacy function of the energy program, particularly in Public Utilities Commission proceedings, legislative initiatives and project evaluation. Legal or policy development experience would be necessary along with the ability to understand and process energy related data to support policy goals.
- **Sustainability Coordinator:** this existing position would continue help integrate energy and other sustainability issues for county operations and programs. Grant writing to garner additional funding for energy projects would also be an important function.
- **Transportation energy position:** a new position to implement and track the Priority Actions in the *Transportation* section of the Five Year Roadmap. The position would also support the program head in policy development, strategy, advocacy, data collection, and analysis.
- **Administrative support:** a new position to perform daily clerical and organizational duties.

One additional role could be created within the Department of Public Works' Building Division to assist in energy efficiency and renewable generation measures. This could simply be training and a partial change in job function for an existing position already in a facilities operations role.

From time to time, the energy program manager may also need to retain the services of technical consultants to aid in the development and implementation of new polices and programs. This is particularly true when conducting new strategic plans for specific county operations or participating in critical Public Utilities Commission dockets.

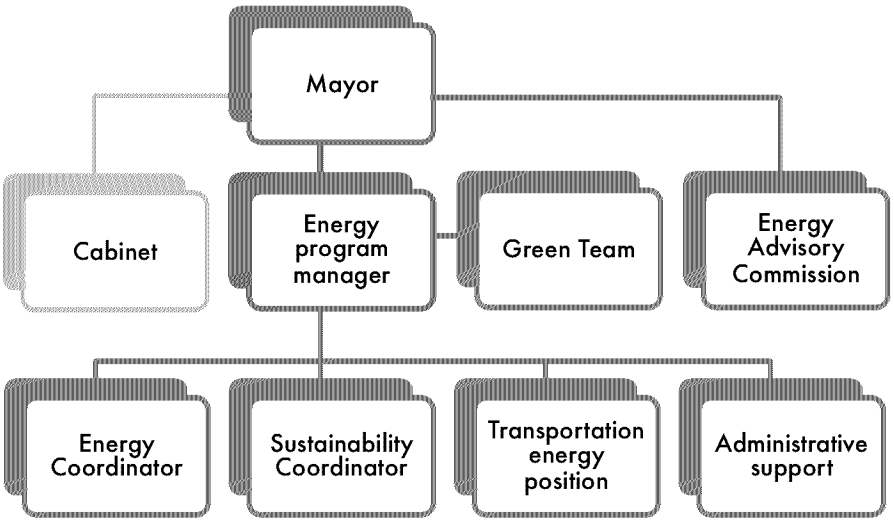

FIGURE 48. STAFF RESOURCES FOR THE COUNTY ENERGY PROGRAM (PROPOSED)

ENERGY PROGRAM MANAGER

The head of the energy program should have a clear mandate from the Mayor and the Managing Director to plan and coordinate the implementation of energy sustainability programs across County departments and agencies. The exact title of the head of the energy program is less important than the function.

The position must have the ability to build trust with the other stakeholders in local and state government, private sector, and the community while also representing the county's interest. The energy program manager must have considerable experience in management and energy project analysis and implementation.

THE GREEN TEAM

Mayor Kenoi officially created the Mayor's Green Team in 2009 as a cross-department group to identify ways for the government to save money by reducing energy consumption, waste and pollution in its own operations. After the resulting Green Government Action Plan was released in 2011, the Green Team was effectively disbanded.

A reconstituted Green Team could provide invaluable support to the energy program in coordinating policies and programs county-wide. The home departments of the permanent team members would allow for up to 10% of the members' time to be focused on Green Team activities. In this way, Green Team members would serve as liaisons for interdepartmental communication and coordination.

The Green Team's would focus on internal County operations and support the other functions of the energy program. It could serve a role in data collection,

analysis, and reporting on annual progress. Some recommended staff to include are:

- Energy program staff
- Energy Management Analyst, Department of Water Supply
- Facilities energy position, Department of Public Works, Building Division
- Automotive Division Director, Department of Public Works
- Budget Administrator, Department of Finance
- Purchasing Agent, Department of Finance
- Manager of Long Range Planning, Planning Department
- Recycling Coordinator, Department of Environmental Management
- Wastewater Deputy Division Chief, Department of Environmental Management
- Buildings manager, Department of Parks and Recreation
- Civil Defense Administrative Officer, Civil Defense Agency
- Geographic Information Systems Analyst, Department of Information Technology
- Mass Transit Administrator, Mass Transit Agency

Energy Advisory Commission

According to its rules of practice and procedure, the purpose of the Mayor's Energy Advisory Commission (EAC) is to advise the mayor on the development and implementation of an energy sustainability plan for the County. The current EAC has fulfilled that role using *Analysis and Recommendations for the Hawai'i County Energy Sustainability Plan* from 2007 as a source document. The EAC has made additional recommendations to the Mayor on an annual basis.

As currently defined, the EAC is coterminous with the current mayor. The EAC should be made permanent by an ordinance amending the County Code. The EAC would assist in energy program functions, particularly strategy development and public information and engagement. As a publicly accessible forum, it can receive feedback from the community on energy policy and desired outcomes. It can investigate particular questions or concerns through the expertise of its members or through requesting information from relevant parties.

Funding for Energy Program Activities

Creating dedicated and predictable funding for the energy program will require a reprioritization of the County's current budget allocations. A revolving energy fund is an important budget tool that can be used to manage the savings from energy projects and reallocate them to the energy program, the general fund and other energy initiatives.

The costs and savings from the recommendations of the Five Year Roadmap are presented in Table 10. These could form the core of the revolving fund for the near future. The estimates are conservative, based on previous performance for similar programs in the state and other published sources. It is important to note that implementation of the Priority Actions will not necessarily start at the same time – some projects can be delayed until savings accumulate in the revolving fund. For the purposes of calculating the five-year program costs all the Priority Actions do begin together which can make Year 1 appear more expensive than it may be in practice. Similarly, the calculated savings reflect current energy costs, which likely underestimate the actual dollar savings that may occur.

TABLE 10. ENERGY PROGRAM AND FIVE YEAR ROADMAP EXPECTED SAVINGS

	Energy program savings ($000)	Year 1	Year 2	Year 3	Year 4	Year 5	Five Year Total
1	**Performance contracting**	-	440	440	440	440	1,760
2	**Renewable generation**	-	320	320	320	320	1,280
3	**Fleet management system**	(150)	725	725	725	725	2,750
4	**Five Year Roadmap Actions**	(53)	(247)	(75)	5	(55)	(425)
5	**New Staffing**	(293)	(293)	(293)	(293)	(293)	(1,463)
6	**Total Operations Savings (Lines 1+2+3)**	-	1,485	1,485	1,485	1,485	5,940
7	**Total Operations Costs Lines 4+5)**	(495)	(540)	(367)	(288)	(347)	(2,037)
8	**Energy Program Savings** (Expenditures) **(Lines 6+7)**	(495)	945	1,118	1,197	1,138	3,903

STAFFING COSTS

As shown in Table 10, the energy program as a whole is expected to have a significant positive impact on the county budget and more than cover its own operations. The salary estimates for the recommended new positions are commensurate with similar positions in other counties in the state and mainland examples.* Employee benefits are approximated by using a 50% multiplier for the total new salaries. It may also be possible to meet the staffing need with contracted employees or outside consultants, though these will likely be more costly options.

* Santa Fe County, NM has two energy managers at $64,480 each in their Department of Public Works. Lee County, FL has a single Sustainability Manager at $58,175 to $92,126. Berkeley, CA has a Energy Programs Manager at $97,284 - $118,260.00 in the Planning Department and Home Energy Administrator at $82,644 to $98,148.00 focusing on low income programs in the Housing & Community Services Department.

TABLE 11. ESTIMATED ANNUAL NEW SALARY AND BENEFITS COSTS FOR THE ENERGY PROGRAM

Position		Salary
Energy program head	New	$95,000
Transportation energy	New	$65,000
Administrative support	New	$35,000
Energy Coordinator	*Existing*	*$65,000*
Sustainability Coordinator	*Existing*	*$65,000*
Total new salaries		**$195,000**
New benefits	**50%**	**$97,500**
Total new staff costs		**$292,500**

REVOLVING ENERGY FUND

A Revolving Energy Fund is a pool of capital that is used to finance energy efficiency and renewable energy projects that are expected to generate consistent energy cost savings into the future. The fund is replenished over time as the energy savings are realized, which allows new projects to be financed. The County of Hawai'i does not currently have a revolving fund for energy projects; however, such a fund could be established by the Department of Finance using seed capital derived from savings from current and future energy projects.

Revolving funds have been widely used across the country for business and economic development, energy efficiency, and community improvement projects.[81] Some revolving funds target only municipal operations, while others are used for both public and private projects.

This fund could be financed by savings from existing and future energy projects. Energy savings and operational cost reductions should be separately tracked, and a portion of those savings would be allocated to the General Fund and the remainder returned to the Revolving Energy Fund to be allocated to future energy projects. Both energy efficiency and renewable energy projects should qualify for financing from the fund.

ENERGY EFFICIENCY AND RENEWABLE ENERGY SAVINGS

Hawai'i Island faces some of the highest energy costs in the nation. The County of Hawai'i spends more than $35M every year on energy costs alone. For this reason, energy efficiency and renewable energy projects developed by the County can result in substantial savings that more than pay for the cost of installation and operation over the life of the project.

For example, the County Department of Research and Development estimates the West Hawai'i Civic Center solar project will save the County about $50,000 every year for the next 20-30 years,[82] This project required no up-front cost to the County. Energy efficiency improvements made to public facilities can also result in

substantial measurable energy savings. The University of Hawai'i – Hilo began installing energy efficiency improvements at its campus in 1996. By 2010, the energy savings totaled more than $52 million, not including maintenance savings of more than $200,000 per year.[83] If the county achieves savings similar to the state (in the range of 5.1% - 13.5% reduction in energy consumption), total savings could equal between $400,000 and over $1 million every year, assuming the price of electricty remains constant.

Private Sector Funding

Public-private partnerships utilizing private sector funds are an important financing source. The private sector's enthusiasm for investing in energy-related projects provides an indication of their general profitability. The West Hawai'i Civic Center solar PV project was financed using almost $2 million in private sector capital with no up-front cost to the County.[82] Private sector funding can be available for renewable energy and energy efficiency projects using innovative financing mechanisms such as Power Purchase Agreements and Energy Performance Contracts.

Power Purchase Agreements are contracts whereby a third party designs and constructs an energy project, and the County agrees to purchase the energy at a specified rate that is significantly less than the cost of energy from HELCO. This financing arrangement allows the County to realize immediate energy expenditure savings without committing capital or operating resources to finance construction. In the case of the West Hawai'i Civic Center, the third-party, SunRun, Inc., owns and maintains the solar PV installation, and the County agrees to purchase the electricity generated by the solar panels for $0.20/kWh (compared to the average HELCO commercial price of approximately $0.41/kWh). Additional details on the recommended approach to renewable generation at county facilities are included in the *Renewable Electricity* section of the Five Year Roadmap.

Energy Performance Contracts are another financing option, typically used for energy efficiency improvements. Under an Energy Performance Contract, a third-party designs and installs a number of energy efficiency improvements and will guarantee a certain amount of energy savings as a result. The County would agree to pay the third-party a monthly sum that is less than the energy savings that have been guaranteed. This payment satisfies the third-party and results in a net savings of energy expenditures to the County. Energy performance contracts are further explored in the *Energy Efficiency* section of the Five Year Roadmap.

State and Federal Grants and Loans

In the fiscal year ending June 30, 2011, the County received more than $57M in state and federal grants.[23] Unfortunately, the availability of state and federal grants for energy projects has significantly declined as the federal American Reinvestment and Recovery Act (ARRA) funds have been depleted. However, the

County is a consistent recipient of state and federal funds designated for transportation, mass transit, agriculture, and economic development. The energy program staff would be responsible for identifying, applying for, and obtaining federal funds for County energy projects.

County General Obligation or Revenue Bond Sales

The County has the statutory authority to sell bonds secured by the County's ability to collect property taxes from island residents. This is the method by which most capital projects are currently financed. Bond sales are frequently used by the County for capital projects because the County is generally able to attract interest in the debt at an acceptably low cost of capital.

The County received $4M in general obligation bond revenue specifically for energy efficiency improvements for county facilities in 2011. These funds are currently managed by the Department of Public Works. As of March 2012, only about $27,000 of this funding source had been spent.[84] Going forward, the County should carefully analyze potential energy efficiency improvements to determine whether self-financing (through utilization of bond revenues or other County funds) is preferable to third party financing (through PPAs or Energy Performance Contracts).

One additional source of federal funding that has not been utilized to date is the Qualified Energy Conservation Bond (QECB) program. This program provides a subsidy to effectively lower the interest rate on taxable bonds issued by a municipality for certain energy efficiency and renewable energy generation projects. As a result of the subsidy, the effective interest rate for these bonds can be less than 2%, which is attractive compared to other sources of financing. The County of Hawai'i has received an allocation of about $1.8 million, which can be used for municipal projects (as long as the energy savings exceed 20%), or for certain kinds of "green communities" programs that include alternative transportation options like mass transit, bike paths, etc., in addition to traditional energy efficiency and renewable energy projects.[85]

County General Fund

The General Fund received about $294M in the fiscal year ending June 30, 2011. Most of this revenue (73%) came from property taxes. General Fund expenditures are made as part of the annual budgeting process. However, even in the best of times competition for General Fund allocations can be fierce among county departments. The County has responded to the recent recession and decline in tax revenue with cuts to programs, services, and staff across all County departments. This suggests only limited General Fund resources may be available for energy program expenditures. Under current practice, cost savings from reductions in energy consumption would be retained in the General Fund and not attributed to

specific programs or departments. The revolving fund discussed above would redirect some of these savings to be reinvested in energy improvements.

The public service company tax is also an important source of revenue for the general fund. Many companies, such as telecommunications providers and private water companies, pay this tax, but HELCO is by far the largest single contributor. It may be more feasible to use this energy-specific revenue for the energy sustainability program than it would be for property tax revenue.

Other County Funds

Other County funds can be allocated to energy program expenses on a case-by-case basis. Each of the County's special funds receives revenue from specified sources and usually precludes expenditures except for certain designated purposes.

For example, the Highway Fund is allocated revenue from the motor vehicle weight tax, liquid fuel taxes, and the public utility franchise fee. These revenues can only be used to finance transportation and mass transit related expenses. The Bikeway Fund, the Sewer Fund, and the Solid Waste Fund are other County funds that may be used for energy related programs, depending on the specific program and funding source.

Energy Program Development and Reporting

Energy program development and reporting should be a predictable recurring process and be aligned with other key planning processes in the County and the State to effectively produce desired outcomes. Demonstrating the value of the energy program is extremely important for its continued success. The energy program does not need to be held to a higher level of scrutiny than other County operations, but should serve as an example of transparency and accountability.

Because energy policy affects every single department the planning activities will be collaborative. The recommended planning and reporting timeline is displayed below. Similar to the structure of this plan, the planning timeline is based on a five-year planning cycle with annual *Action Plans*, reporting and assessment.

Annual Cycle

The annual energy planning cycle is akin to budget planning that takes place for the County as a whole. Overseeing this process would be a primary responsibility of the Energy Manager. Four major planning documents should be produced every year:

- An Annual Action Plan covering the actions for the coming fiscal year and the progress on the Five Year Roadmap.
- A State legislative priorities report with state-level laws and policies that the County would like to see changed either independently or in support of other proposals.
- A legislative outcomes report of the effect of recently passed state law on the County's energy program and adaptation strategies.
- A snapshot fiscal-year-end report to the Mayor and County Council of energy savings to inform the revolving fund and support public engagement.

TABLE 12. KEY ENERGY PROGRAM PLANNING MILESTONES

	Deadline
Legislative priorities	November 1
Interdepartmental program coordination, plan revision	December through May
Annual Action Plan and budget to council (first)	March 1
Annual Action Plan and budget to council (final)	May 5
Legislative outcomes report	One month after close of session
Annual Action Plan with approved budget	July 1
Year-end (fiscal) report to mayor and council	August 15
Draft Annual Action Plan	December 31

FIVE YEAR CYCLE

The Five Year Roadmap included as part of this plan is meant to be a living document. The priority actions that it contains are not the only programs the County could or should pursue in the next five years. The energy staff will likely continually develop new project policy ideas as changes happen at the State level and new opportunities arise. Similarly, current ideas may no longer be viable or necessary in the coming years. The Five Year Roadmap presents a basic organizational scheme that can be adapted to almost any new initiative. Rather than being a shelf reference, the Roadmap should be updated and altered with every annual planning cycle.

The annual changes will likely accumulate and alter the Roadmap significantly from its current form. Once every five years, the energy program manager should lead the effort to comprehensively review the assumptions, analyses, and recommendations of the Roadmap in a process similar to the one that produced this document. Ideally, this would be aligned with the General Plan update process that should be occurring in the next few years.

TRANSPORTATION PRIORITY ACTIONS

Achieving the island's transportation energy goals will require long-term, concerted effort. In the short-term, the County of Hawai'i should organize its actions around County vehicles and operations, transportation system improvements, and County-wide transportation laws and regulations.

The County has several specific powers related transportation planning and regulation that can be leveraged to promote more sustainable and efficient use of energy in transportation. It also can wield influence as a major consumer of fuel on the island with total expenditures of about $7.5 million per year.

Despite the growing enthusiasm around alternative fuels statewide, there is currently no official County policy on alternative fuels for either County use or more general evaluation and support. Not all non-fossil fuels are necessarily appropriate for the island or even sustainable. The Five Year Roadmap presents several new policy options for ensuring that alternative fuels development is in the island's best interest.

The County is also responsible for the mass transit system on the island, providing one of the only alternatives to personal vehicles for daily mobility. The system currently serves a very small percentage of residents despite being an affordable option at only $1 per ride. In addition, the County of Hawai'i invests nearly $40 million each year in maintaining and improving the island's transportation system. These investments should be targeted towards reducing and eventually eliminating the transportation system's reliance on imported energy.

Finally, the County can take steps to promote the adoption of new and better vehicles that consume little or no fossil fuel. It can begin with its own fleet of more than 1,000 registered vehicles (including the privately-owned but publicly subsidized police department fleet, the total rises to more than 1,500 vehicles).[8] A fleet of this size presents many opportunities to improve management and efficiency and also gives the County significant purchasing power to negotiate fuel supply contracts that can incorporate alternative fuels.

TRANSPORTATION
Priority Actions

Promote appropriate energy development and use

1. Coordinate the formation of a large fleet owners consortium.
2. Fund a comprehensive mass transit strategic plan to increase ridership and introduce modern transit management technologies
3. Increase the user-friendliness of Hele-On bus information for riders.
4. Provide grant funding to vehicle dealers and repair businesses to acquire and install electric vehicle servicing equipment.
5. Create a property tax credit for electric vehicle charging stations.

Develop innovative and proactive policy

6. Establish a county-wide priority policy for alternative fuels.
7. Adopt or develop a biofuels evaluation framework to support County decision-making and advocacy that addresses the specific needs of the island.
8. Institute a fuel tax schedule for alternative fuels.
9. Develop a framework for increasing the fuel tax on fossil fuels at a future date.
10. Implement a Complete Streets policy to improve the safety and accessibility of the island's public roadways.
11. Enforce the state law requiring large parking lots to provide electric vehicle parking and charging.

Lead by example in County operations

12. Reduce fossil-fuel consumption in the County fleet through vehicle purchasing and a fleet management system
13. Encourage County employees to use an existing free private platform for carpooling and ridesharing.

TABLE 13. TRANSPORTATION PRIORITY ACTION SUMMARY

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Coordinate the formation of a large fleet owners consortium.	$16,000							EP,DPW
Fund a comprehensive mass transit strategic plan.	$250,000				EP,MTA			
Increase the user-friendliness of Hele-On bus information for riders.	$30,500							EP,MTA
Provide grant funding to vehicle dealers and repair businesses to acquire and install electric vehicle servicing equipment.	$120,000					EP		
Create a property tax credit for electric vehicle charging stations.	$75,000							EP,DFin
Establish a county-wide priority policy for alternative fuels.	$0			EP,DPW-A				
Adopt or develop a biofuels evaluation framework to support County decisionmaking and advocacy that addresses the specific needs of the island.	$50,000					EP		
Institute a fuel tax schedule for alternative fuels.	$0			EP				
Develop a framework for increasing the fuel tax on fossil fuels at a future date.	$0		EP					
Implement a Complete Streets policy to improve the safety and accessibility of the island's public roadways.	$0		EP,DPW,DPlan					
Enforce the state law requiring large parking lots to provide electric vehicle parking and charging.	$0			EP				
Reduce fossil-fuel consumption in the County fleet through vehicle purchasing and a fleet management system	$0							

FIGURE 49. ISLAND TRANSPORTATION FIVE-YEAR ROADMAP SUMMARY*

PROMOTE APPROPRIATE ENERGY DEVELOPMENT AND USE

COORDINATE THE FORMATION OF A LARGE FLEET OWNERS CONSORTIUM

The County is perhaps the largest single consumer of transportation fuel and operator of vehicles on the island. Other potentialy large vehicle fleet owners and operators include State agencies, resorts, car rental companies, tour companies, cab companies, shipping or delivery companies, and transportation contractors. HELCO is a leader in fleet management and has provided information to the County on their fleet management system.

The County should coordinate the formation of a non-profit consortium of large fleet owners and operators with a formal membership. The activities of the

* All the timelines for the priority actions are assumed to start at Year 1, though they can be adjusted as needed. The cost savings from the fleet management system are not included here to avoid double counting in the energy program budget table. The labels next to the timeline bar indicate the positions or departments responsible for implementation. EP= energy program staff, DPW= Department of Public Works, DFin= Finance Department, MTA = Mass Transit Agency, DPlan=Planning Department.

consortium should focus on improving the efficiency of fleet vehicles and their operation. Key strategies of the consortium could include:

- information sharing on best practices, new projects, and industry news;
- making policy recommendations that could help reduce energy demand for fleets;
- funding demonstration projects of energy efficiency in fleet management;
- establishing energy-efficient procurement guidelines or policies for members to reduce costs and streamline management;
- making public commitments to pursue high-efficiency vehicles, alternative fuels and other energy reduction strategies to send strong market signals to suppliers; and
- developing strategies for attracting more efficient vehicles and alternative fuels to the island.

Fund a comprehensive mass transit strategic plan to increase ridership and introduce modern transit management technologies

The mass transit system is one of the few ways the County can directly provide alternatives to personal vehicle transportation. Route planning is already a core activity of the Mass Transit Agency, with service changes being considered continuously. But, background research for this plan revealed no existing strategic plan for mass transit in the County. There is a very substantial body of transportation engineering research on mass transit and planning technology that would be valuable for the development of a strategic plan.

To increase ridership and service quality, the Mass Transit Agency should partner with the energy program staff and the Planning Department to develop a strategic plan for mass transit with the assistance of a professional consultant. The Mass Transit Agency should lead the effort to propose the update to the County Council to obtain funding. A comprehensive strategic plan would include options for expanding service and alterantive public transit options such as van pools and ridesharing.

The plan development would need to include a comprehensive analysis of available data, current data collection methods and potential objective, quantifiable performance measures. The analysis should specifically address equity and affordable transportation access issues.

A data management system could potentially be integrated with the County's fleet management system proposed below. The plan should include a replicable methodology for evaluating system expansion. Indicator tracking is an essential task for the Mass Transit Agency to perform continuously. Any installed data management system should allow for at least quarterly summary data reports.

The Council should require reporting no less than annually. The strategic plan and associated tools must give Mass Transit Agency employees the ability to perform evaluations and interim planning without outside consultants.

Increase the user-friendliness of Hele-On bus information for riders

The Mass Transit Agency has already recognized many of the issues regarding the user-friendliness of the Hele-On bus system and has taken steps for expanded service and bus stop and shelter upgrades. Some limitations of the current service include:

- Hele-on service often requires considerable local knowledge to be used effectively by the public. This issue would be particularly challenging for visitors to the Island.
- The existing route maps are missing several key features that would aid in usability. First, no surrounding streets or landmarks are shown, making it challenging to use the route to access points not directly on the route. Second, individual stops are not identified visually on the map. Third, little to no descriptive information is provided beyond the name of a stop in the schedule accompanying the map (e.g. "Pahoa", or "University of Hawaii - Hilo").
- From the street, many bus stops are not clearly visible, or are not identified. The minutes of the Energy Advisory Commission meeting for November 24, 2010 indicate that a bus stop labeling or visibility program is underway
- Reliability is a problem shared with most bus systems. Delays negatively affect rider satisfaction, but can be more readily anticipated. There are also anecdotal reports of buses leaving earlier than scheduled, which can result in greater rider uncertainty than late buses.

A critical first step for making the Hele-On more user-friendly for residents and visitors alike is to create an easy to use, information-rich website. This should be supported by a comphrehensive data collection and analysis system that allows for public route information, trip planning, and vehicle tracking. A number of tracking and visualization technologies are available today, sometimes even at no cost to the agency.

Ridership and service awareness can be further imrpoved by improved physical branding and visibility of Hele-On buses, bus stops and maps. This would also increase the opportunities and effectiveness of marketing through local media outlets.

Provide grant funding to vehicle dealers and repair businesses to acquire and install electric vehicle servicing equipment

Of the approximately five electric or plug-in hybrid highway vehicles currently commercially available in the US, only the Chevrolet Volt is available for sale on the island. Other vehicles could be purchased from O'ahu or the mainland and shipped to the island. However, a significant drawback of this tactic is the lack of servicing capability by local dealers and repair shops. The Chevrolet Volt and some hybrid vehicles can be serviced on the island with existing hybrid servicing equipment.

Dealers and repair shops must make a difficult economic choice between installing servicing equipment before there is a large enough vehicle base to pay back the costs, and selling vehicles they cannot service. Anecdotal evidence suggests the cost for a dealer to install servicing equipment in an existing facility and train technicians could be up to $100,000.

The energy program manager, together with the Department of Research & Development, should issue a funding solicitation for matching awards for electric vehicle servicing equipment and training. The recommended annual funding level is $40,000 for three years. No single award should be greater than $20,000.

Create a property tax credit for electric vehicle charging stations

According the DBEDT's Hawaii EV Charging Station Database, as of March 29, 2012, there are 26 public EV charging stations at seven sites on Hawai'i Island with and additional location with two chargers expected by June 30, 2012.[26] All the existing charging sites are on the west side of the island. With the increasing availability of plug-in hybrid and all-electric vehicles, more charging infrastructure will be required. However, of the plug-in hybrid and all-electric vehicles currently available commercially in Hawai'i, only the Chevrolet Volt has the EPA rated range to complete a journey from Kailua-Kona to Hilo. A resident purchasing an electric vehicle will most likely need to also install a charging station at an estimated cost of $1,000 or more.

The County Council should adopt as ordinance amending the County Code a one-time electric-vehicle charging station property tax credit of $500. The credit should be directly modeled on the existing solar water heater tax credit, or added directly to Sections 19-04 and 19-05. The credit should be set to expire after 10% of households have installed charging stations. The Council should also allow charging stations to qualify for the alternative energy property tax exemption under Section 19-8.

Develop Innovative and Proactive Policy

Establish a county-wide priority policy for alternative fuels

No formal policy has yet been articulated beyond the commitments in the Vision 20/15 Green Government Action Plan. There are a number of emerging globally focused biofuels evaluation and certifcation schemes that can be adopted or adapted in Hawai'i to give the County the ability to consistently evaluate the sustainability of new projects, policies, and programs.

The Vision 20/15 Green Government Action Plan calls upon the County to:

- Develop alternative fuels purchasing policy (i.e. electric, hydrogen, compressed air) to encourage vehicles powered by indigenous renewable energy sources.
- Purchase bio-diesel (B20) and regularly analyze trends in indigenous bio-diesel production, technology advancements, and cost.
- Prioritize the approval of the permitting process for private developers of alternative fuel sources where it is apparent the county fleet can benefit by fueling its vehicles at such sites
- Track use of alternative fuels.
- Reduce fuel purchases by 135,000 gallons

The County Council should adopt by resolution or ordinance a policy clearly stating the order of priority for alternative fuels in county decisionmaking processes such as procurement and grantmaking. Barring Council approval, the executive branch should adopt an alternative fuel policy for its departments and policymakers. The energy program staff together with the Department of Finance should be responsible for collecting reports on fuel characteristics from producers, distributors and retailers for use in County decisionmaking.

Adopt or develop a biofuels evaluation framework to support County decisionmaking and advocacy that addresses the specific needs of the island.

The biofuels industry on the island is just beginning to develop, with a new biodiesel plant expected during 2012. Supporting the industry is a key goal of state and county policy-makers, and the potential of biofuels production has stimulated interest and investment from landowners, project developers, community members, and government officials. Despite this enthusiasm, there is no coordinated biofuels policy in the State of Hawai'i or in the County of Hawai'i, which means that each department or government body (state or local) proceeds in an ad-hoc basis with regard to new biofuels proposals. Given current zoning and land use law there may be little to no local control over potential biofuels development proposals on the island.

Few methods for systematically evaluating the sustainability of a biofuel have transitioned out of academic literature and into practice. The predominant biofuels certification schemes have emerged from the European Union as a result of the "Renewable Energy Directive".[86] The Directive requires that in order to be eligible for public financial support and to count towards renewable energy goals, a biofuel must be "sustainable." To qualify as "sustainable" a fuel must adhere to a set of criteria set out in the law. The categories include: greenhouse gas emissions; high biodiversity lands; and high carbon stock lands. The burden for compliance and reporting to the government is on the "economic operators" in the biofuel supply chain. Further, the law requires the executive European Commission to verify that the source countries comply with a number of human rights standards.

Rather than develop its own certification scheme the European Commission has decided to formally recognize independent schemes. At least seven have been recognized to date from national governments, industry associations and other collaborations. Three such schemes aim to be potential international standards and are broader in scope than required by EU law: the International Sustainability & Carbon Certification scheme; REDcert; and the Roundtable on Sustainable Biofuels. The Roundtable has gone as far as to establish a US-based non-profit organization to aid in adoption of the scheme. These schemes are comparable to LEED certification, which employs a network of certified professionals and procedures to guide the certification process.

These schemes may not be readily applicable to Hawai‘i, but at least provide a robust basis of documentation, certification, and sustainability criteria.

Because the impacts of a biofuel-dependent economy are so far reaching, a stakeholder-focused process for development of a biofuels approval framework is recommended. Any final framework would ideally work for the entire state. If the County cannot successfully spur state action, it can alternatively coordinate with other county governments. There are other possible strategic partnerships with non-profit organizations to provide support for the certification process.

The first step of such a process should be to examine the suitability of existing certification schemes for Hawai‘i. If necessary, working with the certification oversight organizations to develop supplementary Hawai‘i-specific procedures would be a preferable next step. But unlike the adoption of building codes from published model codes, certification schemes are not incorporated directly into local law. They remain independent and make use of approved third-party certifiers.

If no existing scheme is found to be suitable, the County can pursue developing its own. This will be more labor intensive in both the short and long term. Below are four recommended broad steps for developing a biofuels framework:

- Assess biofuel needs by analyzing current liquid fuel demand on a physical and life-cycle basis.
- Establish acceptable sustainability criteria through a stakeholder process. There will not always be a strictly quantitative way to evaluate all sustainability criteria. At some point there must be a decision on what is qualitatively *good* or *not good* for the island.
- Assess available resources such as land and climate but not specific biofuel feedstocks. The idea is not to define and assess all possible feedstocks or conversion technologies unless the government would like to become a biofuels producer.
- Establish a data collection, reporting, and approval scheme. The most feasible approaches may be to employ self-reporting with review through a government agency or complete a third-party certification.

The most basic use of a biofuels evaluation framework for the County is in its own facilities and equipment. Much in the way LEED is required for state buildings, using an approved or certified biofuel would be a requirement.

Institute a fuel tax schedule for alternative fuels

Hawai'i County Council Resolution 109-07 sets the fuel tax for biodiesel and blends containing at least 20% biodiesel to zero. Only the City & County of Honolulu imposes a biodiesel tax (8.3 cents per gallon). All counties tax ethanol and methanol for highway use, with the County of Hawai'i having the lowest rate at 1.3 and 1.0 cents per gallon, respectively.[87] The County's current taxes on alternative fuels do not derive from a specific guiding policy.

Fuel tax revenues are allocated to the highway fund and managed by the Department of Public Works. The state Department of Taxation data shows zero county revenue for the "other fuels" category, which includes biodiesel, methanol, ethanol, compressed natural gas and liquefied natural gas. This implies no fuel of these types, except possibly biodiesel, were sold in the county.

The County should create a comprehensive tax schedule for alternative fuels through a resolution or ordinance of the County Council that is in agreement with the county policy on alternative fuels.

Develop a framework for increasing the fuel tax at a future date

The original purpose of the fuel tax was not to discourage undesirable fuel types, but to provide a revenue stream for highway maintenance that is roughly proportional to usage. In current practice, it has become a combination of these two functions; no increases of the tax on fossil fuels has been approved since 1988,[88] but most alternative fuels are taxed at a lower rate.

Several alternative fuel tax propsals have been made in the past; however, state law restricts the ability of the County to establish new taxes or divert tax revenue to non-approved uses.

Upon recommendation from the Mayor, the County Council should increase the fuel tax on highway fossil fuels by formal resolution* [89] when high-efficiency vehicles become widely deployed. A key milestone should be when 5% of new vehicles sales are high-efficiency vehicles, including EVs, PHEVs, hybrids, fuel cell vehicles but not including flex-fuel or other internal combustion engine vehicles.

The level of the tax should be set so that a clear price signal is sent to consumers of fossil transportation fuels, without overburdening individuals and households.

Implement a Complete Streets policy to improve the safety and accessibility of the island's public roadways

The State of Hawai'i passed a law in 2010 that established the Complete Streets Task Force (CSTF) to help the state meet the requirements of state law (HRS §264-20.5), which requires the incorporation of Complete Streets principles during the maintenance and new construction of the state's public roadways (including County-owned roads). In 2011, the Hawai'i County Council passed a resolution requesting the Department of Public Works to prepare a Complete Streets policy.[90] The policy is currently under development by the department.

A "Complete Street" is a transportation facility that is planned, designed, operated, and maintained to provide safe mobility for all users, including bicyclists, pedestrians, transit riders, movers of freight, and motorists appropriate to the function and context of the facility. The goals of Complete Streets are to improve the quality of life, environment, and livability of Hawai'i's communities. These design principles are intended to improve roadway safety and mobility for all travelers.[91]

The County of Hawai'i should implement a Complete Streets policy to improve the safety and accessibility of the island's public roadways and comply with state law. The CSTF guidelines provide a good model and should be adopted by the Department of Public Works and the Department of Planning when considering new development projects and the routine construction and maintenance of County roadways.

The guidelines developed by the CSTF recognize that transportation planning and individual project development is particularly sensitive to context, thus blanket requirements are often not appropriate in all cases. The Complete Streets

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* A formal resolution is specific type of County Council action that has an effect similar to an ordinance. Other actions that are governed by formal resolutions include setting property tax rates, approving leases and eminent domain proceedings.

principles are intended to be flexible enough to be tailored to most projects, and can be implemented on a spectrum from simply restriping existing roadways up to reconstructing entire roadways to more safely accommodate bicycles and pedestrians.

Enforce the state law requiring large parking lots to provide electric vehicle parking and charging.

Hawaii Revised Statutes §291-71 mandates that public, private and government parking lot owners with at least one lot containing 100 spaces set aside 1% of their total spaces for electric vehicles, and provide one or more charging stations. When 5,000 EVs are registered in the state, the requirement will increase to 2%, and increase by 1% for each additional 5,000 EVs registered, until it reaches 10%. The law does not specify the responsible enforcement agency or penalties for noncompliance. It also does not specify if the power supplied at the charging station should be free of charge. Given that there are only seven sites on the island with public charging stations according to DBEDT, it does not seem that all possible sites are in compliance with the law.

The Mayor should direct the relevant permitting departments, including Public Works and Planning, to suspend the processing of permits for applicants who are found to be out of compliance with HRS §291-71. Relevant inspectors and auditors should include a check for compliance in any inspections or site visits. If a site inspection or other visit is not already planned for the parking lot permit application, it is not necessary to add one just for the purpose of enforcing this policy.

Lead by Example in County Operations

Reduce fossil-fuel consumption in the County fleet through vehicle purchasing and a fleet management system

Vehicles are critical for the services the County provides to island residents. There are over 1,000 vehicles currently in the County's fleet, not including the police department.* The County spent $7.5 million on fuel in fiscal year 2011, including the police department. Beyond the purchases captured by the Department of Finance, there is no system in place intended to track energy consumption and efficiency for the fleet.

The Department of Research and Development has already begun pursuing a well-developed strategy for electric vehicle deployment in County operations. The

* Most vehicles operated by the Police Department are privately owned by individual police officers.

County now has five plug-in electric vehicles for use by several departments. Replacing the SUVs currently used for passenger transportation with electric vehicles could save the County $1,600 every year per vehicle.[92]

The County would benefit greatly from an official vehicle and fuel purchasing policy that favors technologies with little or no fossil fuel consumption. The overall demand for transportation energy can be greatly reduced by installing a comprehensive fleet management system that tracks vehicle utilization, mileage, and fuel consumption. Fuel cost and operating savings of over 20% have been seen by other organizations that have begun managing their fleet with data-driven decision-making. For the County of Hawai'i, this could translate to nearly $1.5 million saved annually, though a more conservative estimate would be $750,000.

Encourage County employees to use an existing free private platform for carpooling and ridesharing.

Dynamic or real-time ridesharing is a service that allows carpooling to be quickly coordinated between riders and ride providers. Both carpooling and ridesharing services are being established in the private sector but are not yet widespread. The services are web-based and typically not restricted to specific geographies. Some services offer customized private portals for the service that can have a geographic focus and regulated user access. The total potential for energy savings has not been previously studied, but this could be a no-cost program for the County.

The energy program staff would manage the adoption of a voluntary ride-sharing program for county employees as a model to be expanded to all island residents. The program is best started with a pilot at a facility such as the West Hawaii Civic Center. Incentivizing employees to use the service is probably necessary to encourage adoption. Possible strategies include priority parking, public acknowledgment, competitions, and even prizes.

Renewable Electricity Priority Actions

Public discussions about energy sustainability are often dominated by debates about the technology options and infrastructure development for electricity generation. Many policymakers are encouraging the streamlining of renewable energy power plant construction to expedite the transition.

The State regulates the development of power plants through law and the Public Utilities Commission. The County is not in a position to select the projects that will be providing the majority of the island's energy in the future. It must however ensure that energy development proceeds in a way that protects the welfare of residents and the environment. A large construction project of any type must get several approvals and permits from the County. The level of review of these processes is sometimes restrained by State law, but can also be expanded through the County Code and departmental rulemaking.

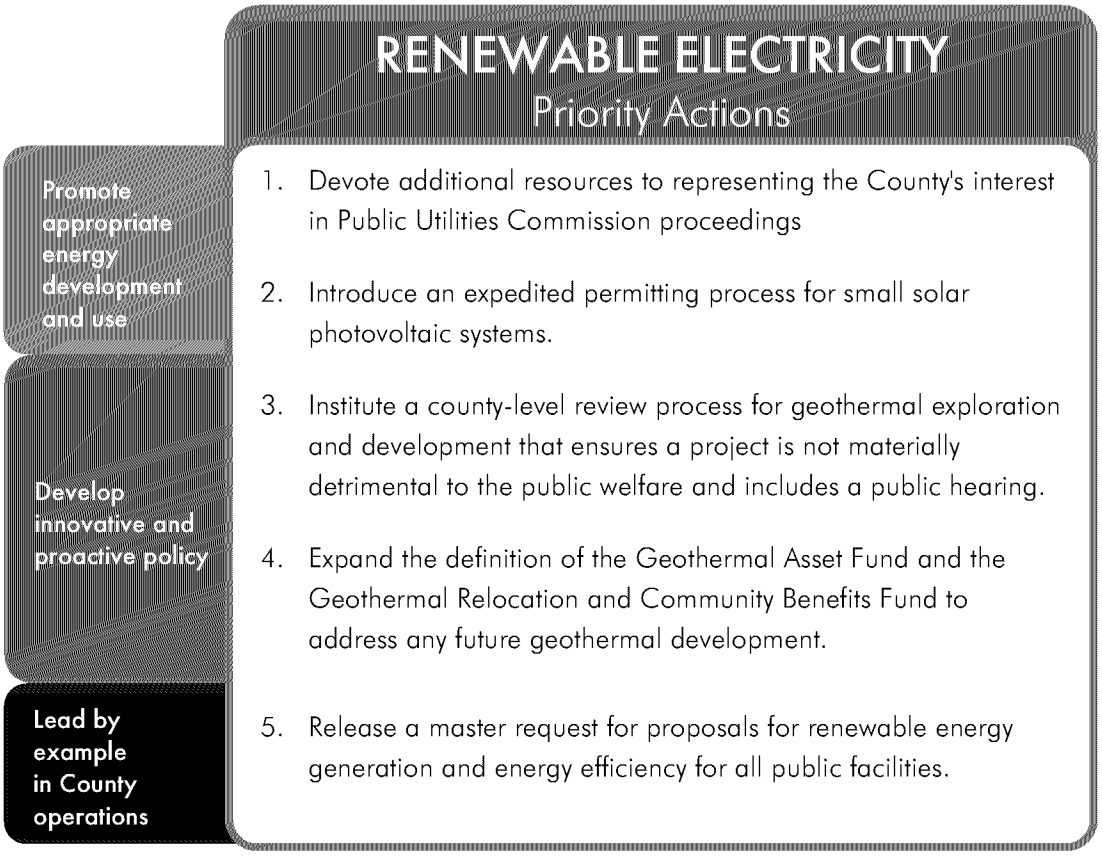


Table 14. Renewable Electricity Priority Action Summary

The County of Hawai'i is limited in its ability to produce or purchase renewable electricity for its own facilities because current state law does not permit the County to sell electricity directly to its citizens or even produce electricity in one location and consume it in another. In addition, the electric utility has excess generating capacity and so does not need to purchase additional electricity in order maintain sufficient supply for the island's needs. However, the utility is obligated to accept new renewable energy under the Feed-in-Tariff and the Net Energy Metering program, but these options are limited to relatively small energy projects and the utility is permitted to reject specific projects at its discretion, for undefined "reliability" reasons.

Given the limitations imposed by state energy policy, in the short-term, the County of Hawai'i should maximize its production of renewable energy allowed by current law, develop smart renewable energy policies designed to facilitate the orderly and appropriate development of the island's renewable energy resources, and support the deployment of technologies likely to help achieve the island's energy goals in the future. *

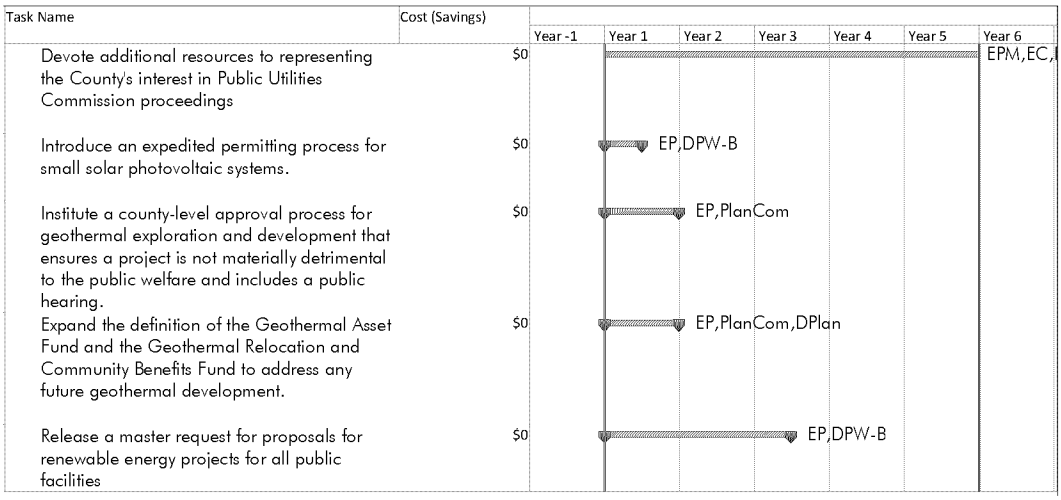


FIGURE 50. RENEWABLE ELECTRICITY FIVE-YEAR ROADMAP SUMMARY†

* The County General Plan is designed "to assure the coordinated development of the county and to promote the general welfare and prosperity of its people."

† All the timelines for the priority actions are assumed to start at Year 1, though they can be adjusted as needed. The cost savings from renewable generation on County facilities are not included here to avoid double counting in the energy program budget table. The labels next to the timeline bar indicate the positions or departments responsible for implementation. EP= energy program staff, DPW= Department of Public Works; B represents Building Division, PlanCom=Planning Commission, EC= Energy Coordinator..

Promote Appropriate Energy Development and Use

Devote additional resources to representing the County's interest in Public Utilities Commission proceedings

Proceedings before the Hawai'i Public Utilities Commission are formal, public, quasi-judicial arenas where major electricity policy and regulatory matters are decided. The County is responsible for ensuring the orderly and appropriate development of the island, and as a large consumer of electricity, it has an additional financial interest in PUC decisions. The County has already participated in a number of dockets, which requires an application to the PUC. The Hawai'i Administrative Rules allow County participation at the PUC's discretion.[93]

Since the Hawai'i Clean Energy Initiative began in 2008, the pace and complexity of change in government regulation of the electric power sector has increased rapidly. The outcomes of these dockets will have far-reaching ramifications for the energy future of the island. There are dozens of electricity-related dockets currently open, and several of these warrant participation by the County of Hawai'i. Assessing the results of docket participation is qualitative and subjective, particularly in the more complex dockets. Broadly, the result of each docket should work towards the guiding principles outlined in this plan. The County should help ensure that state-level priorities do not impose undue burdens on Hawai'i Island.

The County has recently increased the level of participation in proceedings before the Public Utilities Commission, including the Intra-governmental Wheeling and Reliability Standards dockets. The County should devote additional resources to participation in PUC proceedings, including obtaining qualified legal counsel and additional energy policy-related expertise. Participation should be expanded to include the upcoming HELCO rate case, and the Integrated Resource Planning docket. New dockets are opened frequently and activities of the utility and the PUC should be monitored for new policy investigations that may impact the island.

Introduce an expedited permitting process for small solar photovoltaic systems

There are currently no readily available informational resources from the County on how to apply for all the necessary permits for solar thermal or solar PV installations. A PV installation will require an electrical permit and a building permit. A solar thermal installation will additionally require a plumbing permit. Navigating this system of permitting may be particularly challenging for an owner-builder. It requires familiarity with the electrical code, building code and possibly

the plumbing code. An owner-builder will not be able to obtain electrical and plumbing permits without a licensed professional.

Given the similarities between most residential solar PV systems, the permitting process for these installations is unnecessarily long and complex. The Department of Public Works has already begun reviewing its permitting procedures with an aim to reduce processing time. This update should review the model expedited permitting process developed by the Solar America Board for Codes and Standards (Solar ABCS) and make a recommendation to the County Council about adoption. Additional modifications to the expedited permitting process include:

- A clear and simple fee schedule with a single application fee for the expedited permit. The fee should be set so as to adequately account for staff time.
- Priority processing and a guaranteed response time for filed permit.
- A narrow inspection timeframe to reduce contractor labor costs to the customer.
- Recording and reporting of rated system capacity to a central database.

The permit application itself walks the user through all of the requirements and provides all the necessary forms. The materials that must be submitted with the permit are the site diagram, the standard electrical diagram, and the equipment specification sheets. An expedited solar permitting process will lower the administrative burden on solar contractors enabling faster growth of solar photovoltaic projects.

Develop Innovative and Proactive Policy

Institute a county-level review process for geothermal exploration and development that includes a public hearing and ensures a project is not "materially detrimental to the public welfare".

The current County and State administrations have both supported the pursuit of geothermal development as a critical component of energy sustainability for Hawai'i Island. The Geothermal Working Group, created in reponse to Senate Concurrent Resolution 99 in 2010, issused a report generally supportive of geothermal development, while emphasizing a need for ongoing attention to public safety as well as environmental and community impacts. To advance geothermal energy on the island, HELCO issued a request for information for a 50MW geothermal plant in 2011 and received authorization to proceed with a more specific request for propsals from the Public Utilities Comission in May 2012 through Decision & Order 30360 in docket #2012-0092.

The County Council should ensure that the County has an opportunity to review proposed geothermal exploration and development on the island. Any approval process would include a public hearing assess if a proposed project is "materially detrimental to the public" (as is required for a Special Use Permit).

It may be necessary to have a separate County application process for geothermal exploration and geothermal development. Presumably, the exploration process would be less burdensome while still providing for the long-term safety of the drill site. A strict review timeframe is necessary to keep the County accountable and make the process predictable and manageable.

Without the recommended changes, geothermal exploration and development may not be subject to any substantial County land use review other than routine plan approval by the Planning Department. Given the sensitivity towards geothermal energy within the community, it would not be prudent for the County to ignore geothermal applications. There are however other approvals from state agencies, such as air pollution permits and environmental impact statements, which may ultimately address these concerns.

The current Planning Commission rules that govern geothermal resource permits are based on the designation of Geothermal Subzones. In May 2012, Act 97 of the state legislature eliminated Geothermal Subzones by repealing HRS §205-5.1. This law effectively eliminates the County's current geothermal approval process. Instead, geothermal exploration and development will be permissible uses in conservation, rural, urban, and agriculture districts which account for almost all land other than those managed by the Department of Hawaiian Homelands.*

The new law does does not alter the requirement under HRS §343-5 for a power generating facility project to conduct an environmental assessment and, if necessary, a full Environmental Impact Statement (EIS). However, in repealing HRS §205-5.3 it removes the requirement for exploratory drilling to follow the environmental requirements in HRS §343. A Health Impact Assessment (HIA) is a methodology that is similar to an EIS and has successfully been integrated into the EIS process in several jurisdictions. The County should use an HIA for assessing health impacts of proposed geothermal projects.

* A similar issue occurred with a proposed biofuels production plant near Pahala. Under HRS §205-4.5, biofuels processing facilities are permissible on agricultural lands.

Expand the definition of the Geothermal Asset Fund and the Geothermal Relocation and Community Benefits Fund to address any future geothermal development.

In 1995, the County Council established the Geothermal Asset Fund with Ordinance 95-74 as part of the County Code "for the purpose of compensating persons impacted by geothermal energy development activities." Payments from Puna Geothermal Venture, which is specifically named in the law, are the only revenues for the fund. The fund was originally administered by the Planning Commission. After the Commission was separated into the Windward and Leeward Planning Commissions, the Windward Planning Commission assumed responsibility in 2009. Puna Geothermal Venture pays just $50,000 into the fund each year. The FY2010 year-end balance was $2,106,800.[23]

A separate Geothermal Relocation Fund was created by the Council in 1996 by Ordinance 96-2. The fund was subsequently expanded in 2008 to the Geothermal Relocation and Community Benefits Fund by Ordinance 08-37. The fund can be used for two primary purposes: 1) to purchase property from owner-occupants near the PGV plant; and 2) infrastructure and service improvements in Lower Puna. The Planning Department administers the fund. Unlike the Geothermal Asset Fund, this fund does not collect payments directly from PGV, but instead from the geothermal royalties mandated by HRS §182-18 ($568,192.60 was collected in FY 2011). Geothermal royalties are not specific to a particular facility but the "utilization of geothermal resources." As of June 30, 2011 the fund contained $3,277,820, well above the minimum of $1,000,000 required by the County Code.[23]

The Geothermal Asset Fund wasn't created until about six years after PGV was first issued its permit in 1989 with the Relocation Fund following a year later. Rather than wait for the community surrounding a new geothermal development to request compensation, the County can proactively provide for its needs.

The County Council should amend the articles of the County Code pertaining to the Geothermal Asset Fund and the Geothermal Relocation and Community Benefits Fund to be applicable to all permanent geothermal resource developments. The requirement for new facilities to contribute to may be created in the permits issued by the County.

The County's authority to grant geothermal resource permits may no longer exist. If this is the case, then it may be extremely difficult to stipulate that a new project contribute to the Asset Fund. Other permits are of course required, but these are a matter of procedure since geothermal development is permitted in all State Land Use Classifications.

Lead by Example in County Operations

Release a Master Request for Proposals for Renewable Energy Projects for All Public Facilities

The County of Hawai'i has already begun installing renewable energy projects at public facilities around the island. Going forward, the County should combine all its facilities into a Master RFP for renewable energy projects and energy efficiency improvements. The RFP should allow bidders to choose among public and private financing mechanisms (including Energy Performance Contracts, Power Purchase Agreements, self-financed improvements, etc.) so as to provide the lowest-cost energy resources possible.

The County has installed a commercial-scale solar photovoltaic installation at the West Hawai'i Civic Center using an innovative private financing mechanism: the Power Purchase Agreement. This contract allowed the County to realize an immediate savings of $50,000 per year on electricity expenditures with no up-front cost to taxpayers. The County pays $0.20/kWh for electricity produced by the solar system, about half the average cost of electricity on the island. With plans to add battery storage to the system, savings could potentially double.

The County of Hawai'i can build on these successes by releasing a Master Request for Proposals (RFP) for renewable energy for all remaining public facilities, including those managed by the Departments of Public Works, Environmental Management, Water Supply, Parks and Recreation, the Police Department, and the Fire Department.

Special Note: Monitor Maui and Honolulu County Waste-to-Energy Projects But Do Not Pursue a Project in the 5 Year Planning Horizon Unless Costs Decline

Waste-to-energy conversion has been considered as a possible waste management and energy production strategy for Hawai'i Island since at least 2002. The project cost was then estimated at $25 million.[94] The Integrated Resource Plan for HELCO, released in May 2007, was optimistic about an 8MW waste-to-energy facility for the year 2020. The October 2008 Energy Agreement that founded the Hawai'i Clean Energy Initiative contemplated a 4MW plant to be built by 2015. Also during this time, *Analysis and Recommendations for the Hawai'i County Energy Sustainability Plan* (2007) recommended not pursuing waste-to-energy due to "low levels of waste, the possibility of diverting recyclable material to such a plant, the fluctuating nature of the Hawai'i Island waste stream, the inability of waste-to-energy plants to respond to advancements in technology, and the high capital costs associated with construction and operation."

The County issued a request for proposals in 2005 for either mass-burn or thermal gasification, but responses were slow. In 2008, Wheelabrator

Technologies, Inc. was selected with a bid of $125 million.[94] The County Council rejected the contract with a 5 to 4 vote citing excessive cost. However, in 2009 the Integrated Resource and Solid Waste Management Plant (IRSWMP) produced for the County by CH2MHill continued to consider several waste-to-energy options.[78] The study found that overall, from a combined cost, health, environment, and social impact and adaptability perspective, that waste-to-energy was significantly inferior to expanding the Hilo landfill or using only the West Hawai'i landfill. The long-run life-cycle cost comparison showed several small modular waste-to-energy facilities throughout the island would be comparable to the landfill options (for economic costs alone). Most recently in March 2012, consultants RW Beck concluded that closing the Hilo landfill and sending all waste to the West Hawai'i landfill would be a lower cost option than expanding the Hilo landfill.[95] This is the opposite conclusion of the IRSWMP. The RW Beck study did not consider waste-to-energy.

The energy program staff should closely monitor the progress of the recently announced initiative on Maui to develop a 450 ton per day, 10-15 MW plant there. In announcing the project, Mayor Arawaka stated that it would require "no County capital outlay."[96] The request for qualifications issued in March 2012 received responses from 76 companies.[97] If the project is successful, a similar initiative could be considered for Hawai'i County.

Given the political and environmental challenges of a waste-to-energy project and the availability of other immediate options, it is not recommended that the County pursue a waste-to-energy project within the next five years. With any projects that are ultimately pursued it would be best to avoid any capital investment from the County, instead relying on self-financing from the developer. It is important to keep in mind that new waste conversion technologies are being developed around the world. Some may adequately address the economic, environmental and health issues that have hindered past projects. A new feasibility study is almost certainly required, adding to the potential resistance from a public who has seen several studies lead nowhere.

Energy Efficiency Priority Actions

The County of Hawai'i should begin an aggressive energy efficiency program in order to reduce the island's dependency on imported fuels, lower costs to taxpayers, and comply with state law. Energy efficiency for homes and businesses is largely out of the hands of the County government. The immediate priorities of the County should focus on actions that it has explicit authority to carry out, are low or no cost and are not being carried out already. Specifically, it has the ability to create policies through property taxes, building codes, and permitting.

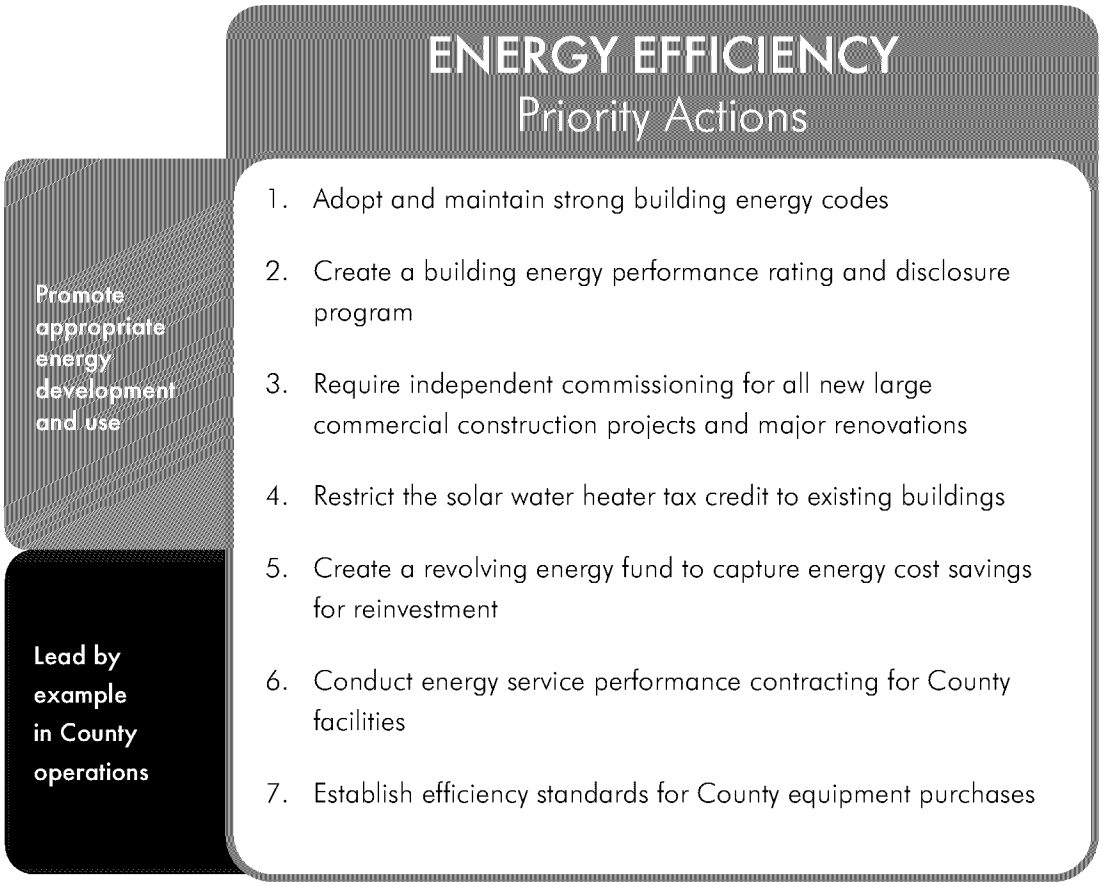


Table 15. Energy Efficiency Priority Action Summary

There are many ways to boost the island's economy and lower energy expenditures through energy efficiency investments. Buildings can be modernized with better lighting, insulation, and water heating. Water pumps and delivery infrastructure can be converted to more efficient systems. These investments begin saving money immediately and can often be financed with zero upfront cost. New construction opportunities usually provide the best bang for the buck since it is comparatively less expensive to install these systems at the time of construction rather than through a retrofit.

However, the County must be careful not to duplicate existing efforts or introduce new layers of programs and policies that only add to the complexity of energy efficiency. For example, while end-use electrical efficiency is a key area for improvement, the state has devoted considerable resources to tackle that challenge through its "Hawaii Energy" program (SAIC, Inc.). The County's more limited resources would be better used to focus on efficiency programs and policies not currently being addressed by others.

As one of the largest energy users on the island, the County can lead by example with its own facilities and operations. The County should strive to eliminate its own fossil energy consumption and become a net renewable energy producer. A combination of building efficiency improvements, end-use efficiency, and distributed generation should be used to achieve this goal. The cost savings should ultimately be passed on to island residents and businesses through improved services or tax savings.

The experience with zero-energy facilities should be extended to the County's building codes and land use planning. The County has a responsibility for local land management that held by no other authority in the state. Before the island can achieve total energy sustainability, new buildings and projects will need to be independent of fossil energy, if not zero-energy or net-energy producing.

Any energy efficiency investment worth pursuing must stand on its own in terms of cost. If the appropriate state and federal policies and programs come into place, the County will need to do very little or nothing to subsidize investments. The county should move away from direct funding towards design requirements and other enabling policies.

The County of Hawai'i has specific control over some taxes and fees that relate to buildings and property. County permit and processing fees are small compared to the cost of a building project, especially for new construction. Reducing or waiving these fees is not likely to generate energy efficiency improvements that would not otherwise have happened. Further, the County relies on fee revenue for many of the services it provides and cannot provide the same volume of subsidies or incentives that state-level programs can. The County should not, and likely cannot, pursue punitive fee structures to encourage energy efficiency.

Because taxes are much higher volume than fees, there is more opportunity to provide rebates and incentives. However, the County should be cautious about the value of lost revenue relative to the benefit to the incentive recipient.

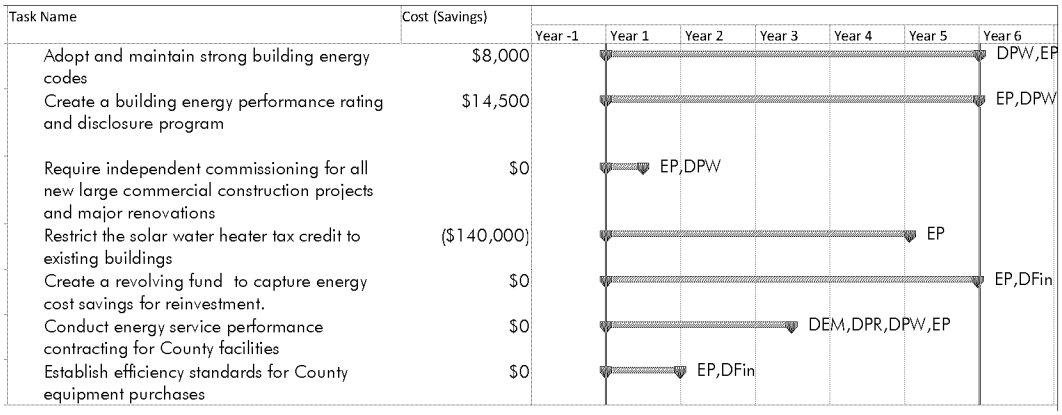


FIGURE 51. ENERGY EFFICIENCY FIVE-YEAR ROADMAP SUMMARY*

PROMOTE APPROPRIATE ENERGY DEVELOPMENT AND USE

Overseeing land use and development is a central responsibility of the County. The three primary tools available are zoning, subdivision, and building codes. The County's building codes are designed to guide construction practices in ways that enhance the safety and security of island residents in their homes and workplaces. Model building codes are developed by construction professionals in internationally recognized proceeding. In addition, the County can use the subdivision and zoning codes to require simple energy efficiency measures in land development.

ADOPT AND MAINTAIN STRONG BUILDING ENERGY CODES

The County Council took a significant step in 2009 when it adopted the 2006 version of the International Energy Conservation Code (IECC); the first time the any version of the IECC had been adopted in the County. Many of the Hawai'i specific amendments went beyond the specifications of the IECC. However, since

*All the timelines for the priority actions are assumed to start at Year 1, though they can be adjusted as needed. The cost savings from energy efficiency are not included here to avoid double counting in the energy program budget table. The labels next to the timeline bar indicate the positions or departments responsible for implementation. EP= energy program staff, DPW= Department of Public Works, DFin= Finance Department, DPlan=Planning Department, PR = Parks & Rec., DEM = Env. Mgmt.

then, two new versions of the IECC have been released and have not been adopted by either the State or the County. While the state Building Code Council does have the primary responsibility for adapting new versions of the IECC to Hawai'i, there do not appear to be any restrictions on individual counties acting independently.

The U.S. DOE reports that the 2009 IECC has a 14% improvement in energy savings over the 2006 version, and the 2012 version has further improvements. The Building Codes Assistance Project estimates that the 2009 IECC and the related ASHRAE 90.1 standard could save the state over $30 million a year in energy costs.[98,99]

The energy program manager should lead the regular adaptation of the International Energy Conservation Code in collaboration with the Department of Public Works and the Planning Department. The staff should track the development of new model codes by the International Code Council and adapt them to Hawai'i as they become available, starting with the 2012 IECC, if they will result in increased energy savings. Adoption should be within one year of publication by the International Code Council.

The new energy codes should specifically address the potential for natural ventilation and other passive cooling design strategies to reduce building energy demand. This may involve coordination with the County Code subdivision regulations, the zoning code and the General Plan to introduce specifications for building orientation, building spacing and neighborhood design.

Create a Building Energy Performance Rating and Disclosure Program

A building energy rating is a simple metric of building energy performance such as a letter grade, a number of stars, or a number score. A disclosure policy requires that building owners share information about a building's energy demand. Disclosure policies may only require that utility bills be shared, the results of a private audit be shared, or actually prescribe the use of a specific building energy rating system.

Building energy performance disclosure is intended to provide information for buyers and tenants that will allow them to more completely compare the cost of occupying a building. This may spur landlords and sellers to invest in energy improvements to achieve a better rating and make their building more attractive to tenants or buyers. Importantly, these would largely be improvements for existing buildings, which building energy codes typically do not address.

The energy program staff and the Department of Public Works should implement a building energy rating and disclosure policy that requires all buildings to provide a valid building energy rating prior to initial occupancy, sale or lease. The staff

and DPW should select a rating system that is appropriate for both commercial and residential buildings, or use a separate system for each building type.

The Department of Energy's Home Energy Score or RESNET HERS is recommended for the residential rating system. The Energy Star Portfolio Manager or the ASHRAE Building Energy Quotient is recommended for the commercial system.

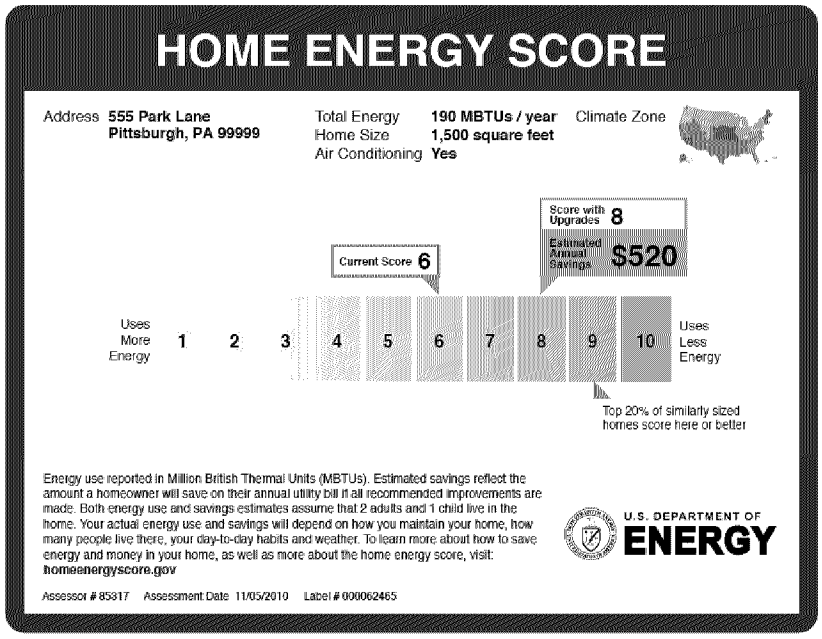


FIGURE 52. AN EXAMPLE HOME ENERGY SCORE LABEL

REQUIRE INDEPENDENT COMMISSIONING FOR ALL NEW LARGE COMMERCIAL CONSTRUCTION PROJECTS AND MAJOR RENOVATIONS

One of the ways the County energy code goes beyond the 2006 IECC is by introducing a requirement for a commissioning plan for commercial buildings. The plan must be provided to the building owner, though the code does not specify by whom. The code defines commissioning as a process that "verifies and documents that the selected building systems have been designed, installed, and function according to the owner's project requirements and construction documents.

A Lawrence Berkeley National Lab study revealed that commissioning adds 0.4% (median) to a construction budget for a new building, but resulted in a 13% (median) energy savings for the whole building. For existing buildings, the median savings were found to be 16%.[100] The study found that commissioning can begin to pay for itself even before any energy savings are realized through reduced

equipment costs. Despite these advantages, commissioning is still a developing practice for both new and existing buildings.

The County Council should expand on the existing commissioning requirement to specify that the commissioning agent be a certified independent third-party, to avoid any conflict of interest. The commissioning plan should be submitted to the Department of Public Works along with the building permit application. The County does not need to review the plan, but should ensure that it has been completed. It is not recommended that the County prescribe the structure or content of the commissioning plan, but should include an estimate of energy savings. The requirement should also extend to commercial buildings undergoing major renovation.

Restrict the Solar Water Heater Tax Credit to Existing Buildings

Solar water heaters are one of the highest impact energy efficiency investments available to residents and businesses in Hawai'i. To this end, the state legislature requires all new single-family homes to include a solar water heater (with certain exceptions). It is unnecessary for the County to subsidize an energy efficiency improvement required by law, especially with the other state and federal rebates and tax incentives available. The current potential lost revenue may exceed $200,000 annually, depending on the number of new homes built.

The solar water tax credit is already a simple law. The County Council should amend County Code to exclude new construction from credit eligibility.

Lead by Example in County Operations

The County spends around $8 million every year on electricity alone (not counting $19 million from the Department of Water Supply). In response, various County departments have already developed existing programs targeting efficiency. The County has existing authority to substantially improve the efficiency of public buildings, and has nearly $4M of capital funding for this purpose. However, many energy efficiency improvements require no up-front investment (through performance contracting and other financial mechanisms), and can potentially deliver a higher rate of return.

County departments have been under considerable pressure to cut expenditures during the recent recession, so it is difficult to suggest programs and policies that require increased spending. By using a combination of targeted investments, no-cost performance contracts, and efficient purchasing rules, the County could establish a revolving fund that would generate new capital for future projects. In addition, a portion of the funds could be re-directed back into the General Fund, to help pay for all County expenses.

Create a revolving energy fund to capture energy cost savings for reinvestment

This priority action was previously discussed in the Funding for Energy Program Activities section. As a critical part of the energy efficiency strategy for the County, it is included with additional details as a Priority Action in Appendix A: Priority Action Implementation Details.

Conduct energy service performance contracting for County facilities

Energy Performance Contracts (EPCs) provide guaranteed energy savings through energy efficiency and renewable energy improvements, paid for by the decrease in utility bills over the life of the contract. The energy efficiency improvements are designed and installed by the Performance Contractor in exchange for a portion of the energy savings. Energy Performance Contracts are designed to minimize initial investment through innovative financing (guaranteed energy savings contracts provide cash flow to finance the initial energy efficiency improvement and the engineering and other services of the performance contractor). This arrangement typically allows for energy efficiency investments to be made without any up-front cost to the customer while still providing for lower energy bills over the life of the investment. State law (HRS §36-41) requires the County to pursue performance contracts: "All agencies [including counties] shall evaluate and identify for implementation energy efficiency retrofitting through performance contracting."

The State is a leader in implementing Energy Performance Contracting: in 2009, total performance contracting investments exceeded $99 million, generating savings of 172.6 GWh in energy use and $271 million in electricity costs).[101] The University of Hawai'i-Hilo and Hawai'i Community College began an EPC in 1996 that involved $11M in energy efficiency investments that has saved more than $52M in energy costs through 2010, with savings projected to increase every year for the life of the improvements. In addition, the improvements have resulted in maintenance expense reductions of $200,000 every year. Other projects on Hawai'i Island include retrofits of police, fire, and public safety facilities whose savings are on-going.[83]

The County of Hawai'i can build on these successes by releasing a Master Request for Proposals (RFP) for and Energy Performance Contract for all remaining public facilities, including those managed by the Departments of Public Works, Environmental Management, Water Supply, the Police Department, the Fire Department and Parks and Recreation.

Establish Efficiency Standards for County Equipment Purchases

The federal government, the State of Hawai'i, and many local governments around the country have established energy efficient product purchasing requirements to ensure adequate consideration of energy efficiency for energy consuming products. The County of Hawai'i should adopt its own energy efficiency specifications in order to achieve the substantial energy and cost savings available. The state and federal standards are available as models through the Hawai'i Revised Statutes, the State Procurement Office and the Federal Energy Management Program (FEMP).

The US Department of Energy has established FEMP, which assists other government agencies "in identifying energy- and water-efficient products that meet federal acquisition requirements, conserve energy, save taxpayer dollars, and reduce environmental impacts."[102] Federal laws and regulations require purchase of ENERGY STAR or FEMP approved products, unless no approved products exist, or no approved product is cost effective (over the product life-cycle, including energy savings).

The State of Hawai'i requires that government purchasing practices include energy efficiency specifications, including life-cycle costing (HRS § 103D-410). HRS § 196-23 requires state agencies to purchase ENERGY STAR products when life-cycle cost effective.

CONCLUSION

The Hawai'i Island is already a leader in the state in adopting renewable energy technologies. However, the island remains overwhelmingly dependent on imported petroleum fuels to meet its energy needs. Energy dependence affects many aspects of the island's economy and imposes significant costs on island residents and businesses, and in particular on low-income households. These costs are expected to increase over time, unless the island takes aggressive, sustained, and coordinated action to eliminate reliance on imported petroleum and rapidly move towards energy self-sufficiency.

The benefits of producing energy from local sources can be captured through technologies that are available today, but transforming the island's energy system is an enormous undertaking. Energy use pervades the economy, and that means the energy industry cannot be easily or quickly adjusted. Above all, the road to the sustainable and secure energy future for the Hawai'i Island requires leadership from the local government and guidance from the people who live in the island's communities.

The *County of Hawai'i Energy Sustainability Program Five Year Roadmap* describes the challenges, highlights the opportunities, and suggests the highest priority actions the County of Hawai'i can take to lead the island to energy sustainability. By implementing the Priority Actions described in the Roadmap, the County can play a leading role in determining the future of the island's energy system, protect the interests of island residents, help ensure the appropriate development of the island's land and other resources, and simultaneously generate significant cost savings to re-invest in a variety of new policies and programs, including returning cost savings to the General Fund to help contribute to all other county programs. The County could save up to $1 million or more per year or more through energy efficiency upgrades to County facilities, installing renewable electricity generation, and introducing a modern fleet management system.

The process of entirely transforming the island's energy system – going from 95% dependency today to 0% dependency – will require the coordinated efforts of thousands of businesses, households, and government agencies throughout the island. The County of Hawai'i has a key responsibility to help the citizens of the island meet this formidable challenge.

Appendix A: Priority Action Implementation Details

This appendix provides additional background and implementation details for each of the Priority Actions included in the Five Year Roadmap. It is primarily intended as a tool for the County staff to identify risks and obstacles and guide implementation of the Five Year Roadmap. It can also be an important tool for accountability both by the County for its own departments and staff, and for the community at large.

Each Priority Action has a regular structure so that they can be easily compared and contrasted with each other. New energy program ideas should employ a similar structure during each of the annual action plans produced for the energy program. Such consistency will be extremely valuable for County administration, County Council, Energy Advisory Commission and other groups interested in the observing progress but without in-depth knowledge of the implementation of the County of Hawai'i Energy Sustainability Plan.

Table 16. Elements of the Priority Actions

Element	Description
Title	Summary of the high-level action recommended
Section	Either Transportation, Renewable Electricity or Energy Efficiency, as introduced in the Five Year Roadmap
Strategy category	One of the three county-focused strategies from the Five Year Plan: ▪ Develop innovative and proactive policy ▪ Lead by example in County operations ▪ Promote appropriate energy development and use
Background	Information to provide context for the Priority Action including current County activities, examples of success, related state policies and potential resources for implementation.
Recommendation	A description of the major steps for implementation and critical elements of the policy or program.
Impact and Benefits	A simple explanation of the rational for including the Priority Action in the Plan.
Measuring Success	A discussion of the major milestones that would indicate a Priority Action has been successful along with strategies for assessing success.
Key Indicators	Quantitative measures of program progress to be included in the data collection and reporting activities of the energy program staff.

Element	Description
Authority	Rules, laws and common practices that allow the County to take implement the Priority Action.
Timeline	The timelines do not assume that a program will be started or completed on a specific date. Rather, milestones are described starting with Year 1. This will useful for later reorganization, prioritization and aggregation by County employees when planning work in the future. With most Priority Actions, there will certainly be a lag between the completion of the Plan and prioritization and approval for specific action. The timelines have all been created with a popular project management software package so can be easily adapted to changing circumstances. The timeline figures also display the anticipated 5-year costs and savings estimates except in cases where they are already included in the energy program budget The labels to the right of each timeline bar represent the positions and/or departments responsible for implementation. EP = energy program staff; EPM = energy program manager; EC = Energy Coordinator; SC = Sustainability Coordinator; TE = Transportation energy position; FEM = Facilities energy manager. DPW = Dept. of Public Works with A and B representing the Automotive and Buildings Divisions, respectively; MTA = Mass Transit Agency; DPlan = Dept. of Planning; DFin = Dept. of Finance; DPR = Dept. of Parks & Recreation; DEM = Dept. of Env. Mgmt.
Resources Available	Current positions or departments in the County government that have skills and responsibilities that could support implementation.
Resources Needed	Primarily the new positions or roles that are required for effective implementation. It may also include potential partner organizations.
Funding Sources	The primary County funding source for implementation or cost savings.
Responsible Groups	The primary County departments and agencies with oversight for implementation.
Technical Feasibility	Qualitative assessment of Priority Action complexity and key barriers to implementation with potential solutions.
Political Feasibility	Qualitative assessment of key barriers to implementation within county and state government and potential solutions.
Community Support	Qualitative assessment, broad description of anticipated issues with results from community engagement, if any.

TRANSPORTATION

Transportation | Promote appropriate energy development and use

COORDINATE THE FORMATION OF A LARGE FLEET OWNERS CONSORTIUM

BACKGROUND

With more than 1,000 vehicles (excluding privately-owned vehicles operated by Police Department personnel), the County is perhaps the largest single consumer of transportation fuel and operator of vehicles on the island. As discussed in the fleet management Priority Action, the County has a clear financial incentive to improve its own fleet. Other potentially large vehicle fleet owners and operators that could benefit from the County's experience include state agencies, resorts, car rental companies, tour companies, cab companies, and transportation contractors.

In its 2011 recommendations to the Mayor, the Energy Advisory Commission suggested that the County take the lead in creating an association for public and private large vehicle fleet owners and managers. Fleet management is a well-developed profession with certifications, trade groups, membership organizations and trade publications. However, lessons from the mainland United States may not always be applicable to the specific conditions of Hawai'i Island that affect vehicle performance and maintenance.

RECOMMENDATION

The County should coordinate the formation of a non-profit consortium of large fleet owners and operators with a formal membership. Potential members: State agencies, resorts, car rental companies, tour companies, cab companies, delivery companies, construction companies, and transportation contractors.

The energy program staff can conduct outreach to potential members on the island to convene an initial meeting to discuss the concept of forming a consortium and the expectations of the participants. Depending on the level of interest and support that results from the initial meeting and strategy formation, the consortium may be more effective as an independent organization (e.g. as a tax-exempt 501(c)6) non-profit). Under these conditions, the County should

be a regular member of the consortium and not have any special powers. A governing board elected by the membership could oversee the ongoing development and activities of the consortium. The consortium should be funded by the members and possibly employ one or more staff members to carry out the day-to-day business of the consortium. An existing independent non-profit organization may also serve as the administrative home of the consortium.

The activities of the consortium should focus on improving the efficiency of fleet vehicles and their operation. Key activities of the consortium could include:

- information sharing on best practices, new projects, and industry news;
- making policy recommendations that could help reduce energy demand for fleets;
- funding demonstration projects of energy efficiency in fleet management;
- establishing energy-efficient procurement guidelines or policies for members to reduce costs and streamline management;
- making public commitments to pursue high-efficiency vehicles, alternative fuels and other energy reduction strategies to send strong market signals to suppliers; and
- developing strategies for attracting more efficient vehicles and alternative fuels to the island.

Impact & Benefits

If the County aggressively pursues strong vehicle purchasing polices and shows success in reducing fuel consumption, it can communicate the best practices to other consortium members. This could help ease the transition for other fleet owners. Similarly, other consortium members will be able to contribute best practices.

The consortium members can also communicate their needs and goals to vehicle suppliers and service providers. This may help draw a larger number of high-efficiency vehicles to the island.

MEASURING SUCCESS

A report from the consortium records of ideas, best practices and actions taken. The success of individual policies and actions that arise out of member discussions should be tracked as part of the overall energy sustainability program.

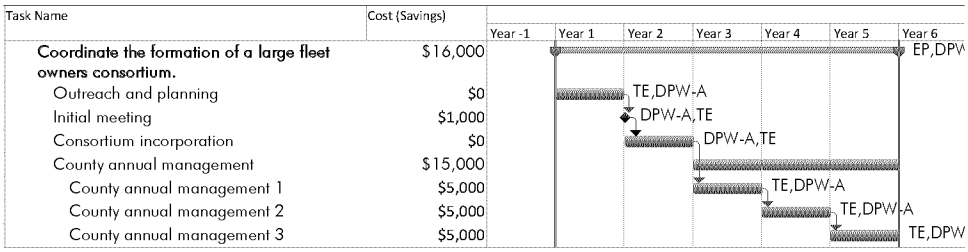
Key Indicators

- Large fleet fuel consumption
- Vehicle stock of fleet
- Fuel economy of fleet
- Vehicle replacement rate

AUTHORITY

Chapter 2, Article 25 of the County Code outlines the rules and procedures for providing grants to or purchasing services from non-profit organizations. The requirements are not applicable if an activity or program is co-sponsored by a County agency with a partner or partners. The Department of Research & Development issues an annual "Supplemental Funding Awards" solicitation with a specific energy sector grants of $5,000 to $20,000. Creating "private-public partnerships for energy, transportation and infrastructure research..." is a specific goal of the program. The Director makes the final funding decision. Funds cannot be used for "salaries, equipment, capital, improvements, [and] construction." Under these rules, the County's contribution to the consortium's budget would need to be restricted to operating costs and materials.

TIMELINE



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Sustainability Coordinator
Resources Needed	▪ Transportation energy position ▪ Consortium members ▪ Funding
Funding Sources	▪ Revolving energy fund (savings) ▪ Energy program budget (Currently R&D supplemental funding awards program) ▪ Matching funds from members

Responsible Groups	▪ Energy program staff ▪ Department of Public Works ▪ Other county departments with fleet oversight ▪ Large fleet owners

Risk Assessment	
Technical Feasibility	Arranging a meeting and coordinating communication should not present a challenge. Establishing an independent organization, if desired by the potential members, would not be the sole responsibility of the County and should be led by the consortium as a whole.
Political Feasibility	County participation in the consortium would be subject to the annual budget approval process. There may be additional concerns with the County being a formal and dues-paying member of an independent consortium, though an existing example is the County's membership in ICLEI – Local Governments for Sustainability. Formal association with any private businesses with which the County also has a purchasing relationship may be inappropriate. Coordination by a third-party non-profit may help to ease this concern.
Community Support	It may be challenging to communicate the benefit of the consortium to the broader community. However, if there is a focus on cost-reduction and management efficiencies it will be more attractive. In addition, if it succeeds in bringing more transportation options to the island, it may be seen more favorably.

FUND A COMPREHENSIVE MASS TRANSIT STRATEGIC PLAN TO INCREASE RIDERSHIP AND INTRODUCE MODERN TRANSIT MANAGEMENT TECHNOLOGIES

BACKGROUND

Route planning is already a core activity of the Mass Transit agency, with service changes being considered continuously. However, background research for this plan revealed no existing strategic plan for mass transit in the County. There is a very substantial body of transportation engineering research on mass transit and planning technology that would be valuable for the development of a plan.

A public vanpool program is a rural transportation option generally used for long distance commutes for groups of 12 to 15 workers (depending on van size).[103] Vanpool programs typically do not use paid employees or contractors to operate the vehicles. Rather, the drivers are commuters themselves and have responsibility for the vehicle and rider coordination but ride for free. The other riders pay a fee that either partially or completely covers the cost of operation and vehicle purchase, with the balance (if any) covered by the public transit authority. In many cases, the vanpool groups self-assemble and then request a van. A successful program in central Washington state has consistent wait lists for participation and has demonstrated cost savings for participants.[104]

There is no dedicated advisory board for the Mass Transit Agency, but one secondary function of the County Transportation Commission is to serve an advisory role. The primary role of the Commission is to oversee private transportation companies including taxicabs.

The Energy Advisory Commission provided the Mayor with a list of high-priority energy policy recommendations in early 2011 and again in 2012. The Commission recommended that the Mayor seek funding for a comprehensive plan to "[optimize] the mass transportation system to minimize gasoline and diesel fuel transportation usage in Hawai'i County." The process would be handled by a contractor through a request for proposals. The estimated budget was $250,000.

There are potentially excess County funds available for the Mass Transit Agency. State law (HRS §249-18) allows money from the highway fund to be spent on mass transit. In FY2010-11 only about 4% or $943,892 of the County's

Highway Fund was allocated to mass transit, about 14% of the agency's $6.9 million budget. Additionally, $5.5 million of highway fund revenues were not expended in FY2010-2011.

RECOMMENDATION

The Mass Transit Agency should partner with the energy program staff and the Planning Department to develop a strategic plan for mass transit. The Mass Transit Agency should lead the effort to propose the update to the County Council to obtain funding.

The plan development should be staff-led in collaboration with an established transportation planning consultant selected through a request for proposals process. The initial funding request should contain a mission statement and outline of a stakeholder analysis and a community engagement plan. The Transportation Commission can aid the Mass Transit Agency in identifying priorities and understanding the needs of the individual districts. Further consultation can be sought with the Leeward Planning Commission and the Windward Planning Commission through the Planning Department. This process can occur in concert with the General Plan update.

The plan development should include a comprehensive analysis of available data, current data collection methods and potential objective, quantifiable performance measures. Vanpool and ridesharing options should be explicitly examined.

Indicator tracking is an essential task for the Mass Transit Agency to perform continuously. The Council should require reporting no less than annually. See "Indicators" below for a sample list of data to collect and track. The plan and associated tools must give Mass Transit Agency employees the ability to perform evaluations and interim planning without outside consultants

The final plan should include a timeline for plan updates and interim reporting, assessment and benchmarking (distinct from but complementary to annual data reporting). The County Council should consider requiring future planning by ordinance, as with the General Plan.

IMPACT & BENEFITS

A strategic plan that incorporates new technologies and strategies will allow the mass transit system to better meet the needs of county residents. Importantly, it can give the Mass Transit Agency tools to conduct continual analysis and planning as the county grows and changes. Well-designed information tracking will give the

County a much better understanding of the energy savings attributable to mass transit.

Substantial research would be required to assess the viability of a large van pool program given the significant investment required for such a program. However, the program could potentially be designed to cover the cost of the vehicles and operations through user fees. Beginning with leased vans could allow for a lower-cost pilot program. Large employers may be willing to support the program for their own workers. Managing the program would most likely require additional staff support from the County or a contractor. Integrating the vehicles with a County-wide fleet management system would help to ensure that the vehicles were be used only for their designated routes.

MEASURING SUCCESS

Confirming a direct impact of the plan may not be possible, but increased ridership will be the strongest metric. More specifically, evaluating how travelers have transitioned from higher energy intensity modes of transportation to mass transit and the avoided energy consumption will be necessary to justify the continued growth of the system. Similarly important is rider satisfaction with the service provided. With improved data collection, it may also be possible to calculate cost of each unit of fossil energy saved and thus compare it to other transportation options and other energy policies in general.

Key Indicators

Sample only:

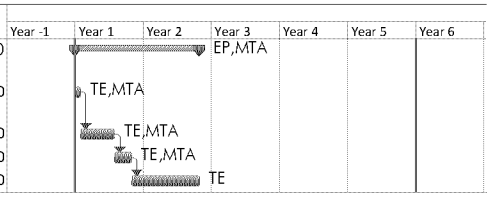
- Ridership
- Ridership per route
- Miles traveled per route
- Miles traveled per vehicle
- Population density near stops
- Employment density near stops
- Modes of transportation to work
- Population demographics near stops
- Equity of service across demographic groups
- Cost-effectiveness and service level
- Labor hours per metric

AUTHORITY

Chapter 2, Article 14 of the County Code, which creates the Mass Transit Agency, does not specifically assign it the power or responsibility to create a master plan nor preclude it from doing so. The process may be best initiated by the Managing Director.

TIMELINE

Task Name	Cost (Savings)
Fund a comprehensive mass transit strategic plan.	$250,000
Draft appropriations request or include in budget	$0
Develop RFP for planning consultant	$0
RFP response period	$0
Plan development with consultant	$250,000



Resource Assessment	
Resources Available	▪ Existing Mass Transit Agency staff: 7 ▪ Energy Coordinator
Resources Needed	▪ Transportation energy position ▪ Consultant team ▪ Funding
Funding Sources	▪ Revolving energy fund ▪ Highway Fund ▪ Grants
Responsible Groups	▪ Mass Transit Agency ▪ Energy program staff ▪ County Council ▪ Planning Department ▪ Transportation Commission ▪ Planning Commissions

Risk Assessment	
Technical Feasibility	The planning effort would be data-intensive, but selecting an appropriate outside consultant can will mitigate the challenge. The available body of literature is large and may require an additional organizational plan to be effective.
Political Feasibility	As an important tool for the reduction of energy consumption in transportation, mass transit should be among the highest priorities for energy sustainability. Energy is often overlooked in transportation planning. By making it a priority, the County can take the lead in the state in energy independence and fossil-fuel reduction. Transportation is also a major economic enabler that can suffer under rising prices.
Community Support	If preceded by or combined with user-friendliness improvements, there should be broad community support. Community development plans show support for mass transit development.

Increase the user-friendliness of Hele-On bus information for riders.

Background

The Mass Transit Agency has already recognized many of the issues regarding the user-friendliness of the Hele-On bus system and has taken steps for expanded service, and bus stop and shelter upgrades. Some limitations of the current service include:

- Hele-on service often requires considerable local knowledge to be used effectively by the public. This issue would be particularly challenging for visitors to the island.
- The existing route maps are missing several key features that would aid in usability. First, no surrounding streets or landmarks are shown, making it challenging to use the route to access points not directly on the route. Second, individual stops are not identified visually on the map. Third, little to no descriptive information is provided beyond the name of a stop in the schedule accompanying the map (e.g. "Pahoa", or "University of Hawaii - Hilo").
- From the street, many bus stops are not clearly visible, or are not identified. The Mass Transit Agency is in the process of building 29 bus shelters and adding signs to each bus stop.
- Reliability is a problem shared with most bus systems. Delays negatively affect rider satisfaction, but can be more readily anticipated. There are also anecdotal reports of buses leaving earlier than scheduled, which can result in greater rider uncertainty than late buses.

The Mass Transit Agency was allocated $3,955,499 from the General Fund for FY2011-12 (of this $2.4 million came from federal grants) and $4,044,593 from the Highway Fund. For comparison, Maui County's Department of Transportation received $7,002,500 for its public transit program. The Maui budget does not include equipment purchases. Similar funding levels are expected for the next fiscal years.

RECOMMENDATION

A critical first step for making the Hele-On easier to use for residents and visitors alike is to create an easy to use, information-rich website. The recent redesign of www.hawaiicounty.gov is a good model. Heleonbus.org can host the necessary route, stop and map resources to make trip planning quicker and more reliable. It can also serve as single contact point for service feedback and community surveys. Users should be able to indicate their desire for increased service to their area, and pinpoint the best location on a map so the Mass Transit Agency staff can assess trends.

Public Route Information Vehicle Tracking

The data management system should be developed by issuing an RFI to develop a list of vendors, followed by an RFP for an outside developer to create the necessary infrastructure and processes. The customer display side of the route and vehicle tracking system can be developed with a separate RFP, with the option to combine the application with the data management RFP. Ideally, the service would be based on a recognized standard such as the General Transit Feed Specification (GTFS) or Extensible Markup Language (XML). By using a standard data structure, Hawai'i County mass transit data could be more easily integrated into new and existing third-party applications and services in use by the public. Using a recognized standard will also allow for more analysis and idea generation within the Mass Transit Agency. The RFP(s) should include specifications for:

- An Mass Transit Agency employee interface and analysis tools;
- straightforward route and schedule updates by Mass Transit Agency employee;
- ongoing technical support and periodic system service;
- publicly accessible data feed;
- web-based scalable mapping of routes and stops with links to schedules;
- real-time tracking of vehicle location, arrival times and service changes; and
- trip planning functions.

GTFS is an open-source and widely recognized platform for providing static mass transit data to other services or developers. The largest host of data is Google, Inc., who participated in the development of the standard, but it can be used freely by any group. There is no fee to add static transit data to Google Maps, and possibly other services, including stop locations, routes,

and schedules. GTFS-real-time is a supplementary standard that allows for live vehicle location tracking. Over 350 transit systems currently use GTFS. It is compatible with the open-source OpenTripPlanner in use by several cities.

The Mass Transit Agency should also make available updated static (PDF or other format) maps that show routes, stops, stop descriptions, and surrounding streets and landmarks.

Physical Branding and Visibility

The Mass Transit Agency should undertake a concerted effort to increase the visibility of Hele-On stops, routes and value to the community. On-street visibility of the bus stops would complement a more robust web based information. Each stop should be labeled so visitors can immediately recognize the service being provided. Caution needs to be paid to the "billboard ban" law outlined in HRS §445-111 to 121 and Chapter 3 of the County Code. Information, including maps, about each route servicing a given stop should be permanently displayed at the stop.

The Mass Transit Agency could tap the creative community of the Island with a design contest for Hele-On bus stop signs and information displays. The contest could also include an opportunity to design a new logo and slogan that could be included and integrated into the development of a new website. A small cash reward could be provided. High school and college students should be actively involved.

Marketing

With an updated website and information tools, the Mass Transit Agency should develop a publicity and education strategy to attract more riders. When service does expand, the Mass Transit Agency should take advantage of the many local radio stations and news sources to advertise the change.

Impact & Benefits

The intended result of supplying more and better information to riders is to increase ridership. Residents and visitors will be able to more effectively plan their trips in advance or on the fly. Increased usability may draw new riders to mass transit that previously did not use it. Visitors in particular will be able to more quickly learn how to use the system and potentially substitute a mass transit trip for a personal vehicle trip.

MEASURING SUCCESS

As with the mass transit strategic plan, there may not be a directly measureable effect in terms of ridership or system performance. Formal and informal surveys of riders and non-riders would be necessary to assess the effectiveness of new information tools on ridership. A regular and consistent annual report from the agency on program success to the Mayor and the County Council is necessary for continued improvement.

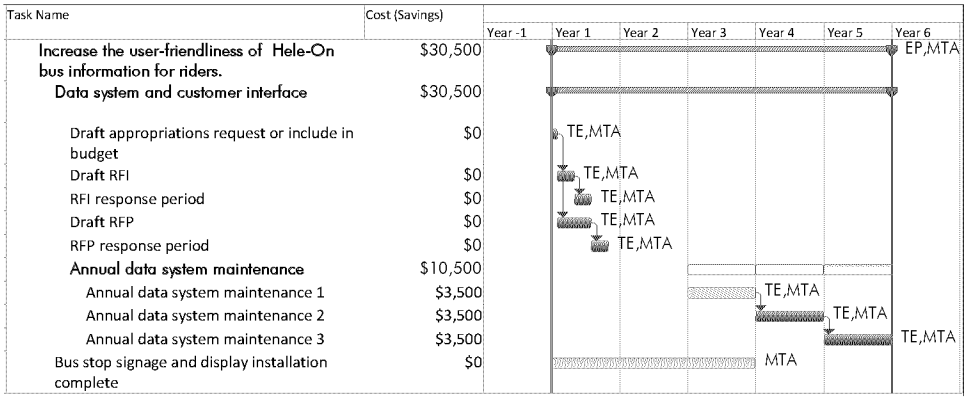
Key Indicators

- Boardings
- Passenger-miles traveled
- Vehicle-miles traveled
- Energy consumption
- Cost per passenger

AUTHORITY

The Mass Transit Agency is authorized by the County Code to oversee the Island's public transportation system.

TIMELINE



Resource Assessment	
Resources Available	▪ Existing Mass Transit Agency staff: 7 ▪ Department of Information Technology
Resources Needed	▪ Transportation energy position ▪ Web design contractor ▪ Data systems consultant ▪ Funding
Funding Sources	▪ Revolving energy fund ▪ Fares (General Fund) ▪ Highway Fund ▪ Grants

Responsible Groups	▪ Mass Transit Agency ▪ Energy program staff ▪ Information Technology

Risk Assessment	
Technical Feasibility	There is a learning curve for all data management systems. With appropriate contracting, the right tools and training should be provided to the agency staff to make implementation possible.
Political Feasibility	The value of increased data resolution will be extremely valuable to the County decision makers. It will allow the Mass Transit Agency to more fully describe its system and plan for growth.
Community Support	The community should be extremely responsive to increased information about mass transit. The ability to use common web platforms to access route and stop information will be convenient for occasional and frequent users.

PROVIDE GRANT FUNDING TO VEHICLE DEALERS AND REPAIR BUSINESSES TO ACQUIRE AND INSTALL ELECTRIC VEHICLE SERVICING EQUIPMENT.

BACKGROUND

Of the approximately five electric or plug-in hybrid highway vehicles currently commercially available in the US, only the Chevrolet Volt is available for sale on the island. Other vehicles could be purchased from O'ahu or the mainland and shipped to the island. However, a significant drawback is the lack of servicing capability by local dealers and repair shops. The Chevrolet Volt and hybrid vehicles can be serviced on the island with existing hybrid servicing equipment. Other manufacturers who produce and sell hybrids through local dealers, but do not yet sell electric vehicles or plug-in hybrids, may have a similar service capacity.

Dealers must make a difficult economic choice between installing servicing equipment before there is a large enough vehicle base to pay back the costs and selling vehicles they cannot service. Research suggests the cost for a dealer to install servicing equipment in an existing facility and train technicians could be up to $100,000.

Improvements made to repair facilities to allow for electric vehicle servicing may be exempt from property taxes under Section 19-82 of the County Code. To qualify an improvement must result in "[a]n increased level of efficiency in the utilization of energy produced by fossil fuels or in the utilization of secondary forms of energy dependent upon fossil fuels for its generation."

RECOMMENDATION

The energy program staff, together with the Department of Research & Development, should issue a funding solicitation for matching awards for electric vehicle servicing equipment and training. Applicants should be limited to local vehicle dealers and maintenance companies. Applicants must have a demonstrable capability to install and operate the equipment, and provide an high level of service to customers. All applications should include a budget and timeline, with a project start date within the same County fiscal year as the funding award. If no suitable applicants are found, funding should be held

over for later years.

The recommended annual funding level is $40,000 each year for three years for approximately six projects total.

The proposed fleet owners consortium may be able to organize additional funding and implementation support.

Impact & Benefits

Allowing dealers and repair businesses to overcome the "chicken or egg" challenge should allow them to provide better service. This is essential for building consumer confidence in new vehicle technologies. The equipment may also require new training and employees.

Measuring success

An early indicator of success would be a large number of applications from dealers and repair business for the grant. The total repair capacity of the grant recipients would ideally align with the anticipated growth in new electric vehicles.

Once in operation, the number and type of actual repairs performed will help the County understand other potential challenges to adoption. The County could survey new electric vehicle owners at the time of registration to understand their reasons for making the purchase.

Key Indicators

- High-efficiency vehicle sales by type
- High-efficiency vehicle registrations
- EV-capable dealers and repair shops

Authority

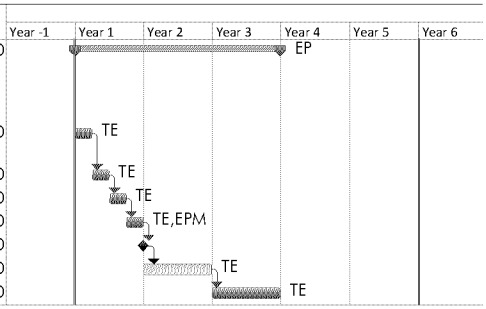
The Department of Research & Development issues an annual "Supplemental Funding Awards" solicitation with a specific energy sector grants of $5,000 to $20,000 in FY2012-13. Creating "private-public partnerships for energy, transportation and infrastructure research..." is a specific goal of the program.

However, the program rules rules preclude for-profit businesses and the use of awards for "salaries, equipment, capital, improvements, [or] construction." To be used for funding repair equipment, these rules would have to be amended by the County, or a separate but similar fund would have to be created for the awards to be made. The Mayor may request additional appropriations for this program from the County Council as part of the budget process. The Director makes the final

funding decision. The funding function of R&D is not included in the County Code or County Charter.

TIMELINE

Task Name	Cost (Savings)
Provide grant funding to vehicle dealers and repair businesses to acquire and install electric vehicle servicing equipment.	$120,000
Draft appropriations request or include in budget	$0
Develop funding solicitation	$0
Solicitation period	$40,000
Proposal review	$0
First award decision	$0
Begin second solicitation	$40,000
Begin third solicitation	$40,000



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Supplementary Funding Awards
Resources Needed	▪ Transportation energy position
Funding Sources	▪ Revolving energy fund ▪ R&D Supplemental Funding (with modifications) ▪ General fund appropriation ▪ Matching funds from other sources
Responsible Groups	▪ Energy program staff ▪ Department of Finance ▪ County Council ▪ Auto dealers ▪ Auto repair businesses

Risk Assessment	
Technical Feasibility	The County has established grant making procedures that can be followed by experienced employees with simple modifications.
Political Feasibility	Since for-profit businesses are currently explicitly excluded from the supplemental funding award process, there may be resistance to modifying the rules for a specific case. However, the County Code does not appear to exclude grants to for-profit businesses entirely.
Community Support	See above. In addition, access to critical infrastructure to enable electric vehicle ownership may be seen as a positive use of public money. Since electric vehicles are likely to only be available to higher income residents in the near term, this could be viewed as a "subsidy" that isn't equitably distrubuted. In the longer term, residents of all incomes may have access to electric vehicles.

CREATE A PROPERTY TAX CREDIT FOR ELECTRIC VEHICLE CHARGING STATIONS.

BACKGROUND

According the DBEDT's Hawaii EV Charging Station Database, as of March 29, 2012, there are 26 public EV charging stations at seven sites on Hawai'i Island with and additional location with two chargers expected by June 30, 2012. Only the new charging site will be on the east side of the island. With the increasing availability of plug-in hybrid and all-electric vehicles more charging infrastructure will be required. However, of the plug-in hybrid and all-electric vehicles currently available commercially in Hawai'i, only the Chevrolet Volt has the rated range to complete a journey from Kailua-Kona to Hilo as determined by the Environmental Protection Agency. A resident purchasing an electric vehicle will most likely need to also install a charging station at an estimated cost of $1,000 or more.

In 2008 the County Council adopted one-time property tax credit of $300 for the installation of solar water heaters (Sections 19-04 and 1905). The credit does not have a sunset clause. DBEDT currently provides a 30% rebate for electric vehicle supply equipment (EVSE), up to $500. The program funds were exhausted in May 2012. There are no specific county-level incentives for charging station installation.

RECOMMENDATION

The County Council should adopt as ordinance amending the County Code a one-time electric-vehicle charging station property tax credit of $500. The credit should be directly modeled on the existing solar water heater tax credit or added directly to Sections 19-04 and 19-05. The credit should be set to expire after 5% of households have installed charging stations. The Council should also allow charging stations to qualify for the alternative energy property tax exemption under Section 19-8. Only highway-capable vehicles should qualify for the credit.

The application for the tax credit should require details about the installation to be reported at least annually by the Department of Finance. These include:

- Date of installation
- Product model and manufacturer

- Type of vehicle charged
- Time-of-use pricing by owner

Impact & Benefits

Consumer confidence and comfort is essential for the success of electric vehicles. Supporting private investment in charging infrastructure may make the purchase more attractive. Because an EV has such substantial energy and cost savings. The sunset provision may encourage earlier adoption.

With an estimated 44,000 owner-occupied housing units in the County in 2010, [8] 5% adoption would equate to 2,200 installations. In simple terms, $1.1 million of lost revenue would be spread over as many years as adoption takes. This number would grow along with population. Given the current very low adoption rates, the revenue lost in the first five years is likely to be negligible. For the sake of cost estimates, adoption of 10 vehicles in 2012, doubling each year through 2017 would result in credits totalling $155,000 over the five years.

Measuring success

The basic number of incentives issued will give a measurement of how many charging stations are installed and where. Issuing the incentive may allow the County to develop a list of EV users to survey.

Key Indicators

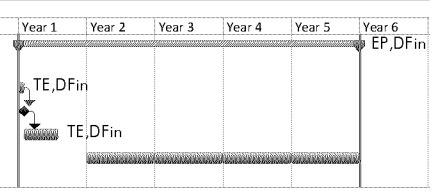
- Number of charging stations installed
- Location of charging stations
- Registered electric vehicles
- Estimated electricity consumption for charging
- Peak demand of charging station

Authority

Article VIII, section 3 of the Hawai'i Constitution grants counties the exclusive power over property taxes.

Timeline

Task Name	Cost (Savings)
Create a property tax credit for electric vehicle charging stations.	$75,000
Draft ordinance	$0
Make recommendation to Council	$0
Forms and application process development	$0
Annual revenue reduction	$75,000



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Existing model County law ▪ Department of Finance
Resources Needed	▪ Transportation energy position
Funding Sources	▪ Revolving energy fund ▪ General fund (real property tax)
Responsible Groups	▪ County Council ▪ Department of Finance

Risk Assessment	
Technical Feasibility	The Department of Finance already administers a similar program.
Political Feasibility	The potential for lost revenue may make gaining support more difficult. However, the solar thermal program has been in effect since 2008.
Community Support	The community is likely to support increasing access to electric vehicles. However, higher-income households are more likely to benefit from the tax credit, especially if vehicle and charging stations costs remain at current levels.

ESTABLISH A COUNTY-WIDE PRIORITY POLICY FOR ALTERNATIVE FUELS.

BACKGROUND

There are a number of state-level policies and programs concering alternative fuels, particularly liquid biofuels and hydrogen. However, there is no formal policy that states specific criteria for determining if a particular fuel should be considered sustainable for Hawai'i. In general, the state and local policies assume that biofuels are sustainable by definition. As has been shown with corn ethanol, biofuels can vary considerably not just between types, but between particular production processes and in some cases may not be sustainable.[105]

The state's "alternate fuels standard" (HRS §196-42) sets a goal to have 30% of highway fuel demand met by "alternate fuels" by 2030. The law is brief and does not assign responsibility for implementation and reporting or penalties as has been done with the Renewable Portfolio Standards for the electric utilities in the state.

The general definition for "alternative fuels" used here is any non-fossil fuel. Classification as "renewable" or "sustainable" is on a case-by-case basis as is discussed in this section. In common practice the term "alternative fuels" often refers to renewable biofuels, waste derived fuels and hydrogen.

The law (HRS §196-42) uses the term "alternate fuel" which it references from the Code of Federal Regulations section 490.2 definition for "alternative fuel." The federal definition includes biofuels and hydrogen and electricity but does not use the words "renewable" or "sustainable" and actually counts fossil fuels such as natural gas and coal-derived fuels. The State's definition does go one step further to include fuels from organic waste and "from water using electricity from renewable energy sources."

The state Renewable Portfolio Standards (RPS) also define what can be considered "renewable energy" for the purposes of electricity generation (HRS §269-91). Biofuels and biogas are included without any additional criteria for evaluating sustainability, local sourcing and production or other priorities. The law also includes "hydrogen produced from renewable energy sources." The Energy Agreement that initiated HCEI did recognize a difference between local and imported biofuels and specified that "no more than 30% of the Hawaiian Electric

utilities' total RPS may come from imported biofuels consumed in utility-owned units." However, this provision was not ultimately incorporated into the RPS (meaning imported biofuels would satisfy the state RPS law).

The Hawai'i Clean Energy Initiative's goal of a 70% reduction in transportation fossil fuel use is more ambitious that the goal in state law. The *HCEI Roadmap* does not suggest any specific policies or processes for evaluating alternative fuels but does recognize that they may be necessary. Some "areas of concern" highlighted are: baseline environmental criteria for all feedstock, chain of custody tracking for feedstock and oils, greenhouse gas emissions accounting and reporting, establishment of a biofuels public trust fund, and public review.

The HCEI terminology is derived from a biofuel policy agreement between the HECO companies and the Natural Resources Defence Council (NRDC).[106] This document is the most fully developed system in the state for evaluating and setting priorities for biofuel sustainability, though it is very focused on palm oil derived fuels and make use of principles and criteria from the Roundtable on Sustainably Palm Oil. Nevertheless, it is a strong starting point for a wider state or county policy.

At the County level, the Vision 20/15 Green Government Action Plan calls upon the County to:

- Develop alternative fuels purchasing policy (i.e. electric, hydrogen, compressed air) to encourage vehicles powered by indigenous renewable energy sources.
- Purchase bio-diesel (B20) and regularly analyze trends in indigenous bio-diesel production, technology advancements, and cost.
- Prioritize the approval of the permitting process for private developers of alternative fuel sources where it is apparent the county fleet can benefit by fueling its vehicles at such sites
- Track use of alternative fuels.

This shows continuity from when, in adopting its sustainability principles developed by the Mayor's Green Team in 2009, the County Council resolved to "approach decisions about policies, operations and capital improvements in a more systematic way." Further, it said decisions should be made while asking: "Does this help move the County of Hawai'i toward sustainability (even if incrementally)?" No formal policy has yet been articulated beyond the commitments in the Vision 20/15 plan. The possible set of non-fossil fuels available to Hawai'i Island is diverse, and the County may not find all fuels to be acceptable for achieving energy sustainability.

The Councy Council implicitly showed support for biodiesel use when it set the fuel tax for fuel blends containing at least 20% biodiesel to zero (Resoluation 109-

07). There are are no specific sustainability criteria that must be met for the biodiesel count towards the blending requirement.

RECOMMENDATION

The County Council should adopt by resolution or ordinance a policy clearly stating the order of priority for alternative fuels in county decision-making processes such as procurement, grant making, tax policy and public advocacy. Barring Council approval, the executive branch should adopt an alternative fuel policy for its departments and policymakers. The energy program staff together with the Department of Finance should be responsible for collecting reports on fuel characteristics from producers, distributors and retailers for use in County decision-making.

The recommended alternative fuel priority policy is:

No fuel should be eligible for applicable county policies and procurement, unless the alternative fuel producer, distributor or retailer demonstrates that the production, distribution, sale and use of each type of fuel it provides does not have the effect of a net increase in fossil-fuel consumption on a life-cycle basis. Other sustainability criteria may also be considered. These priorities should not take precedence at the cost of environmental protection.

- Priority 1: Fuels produced on-island from feedstocks grown on-island.
- Priority 2: Fuels produced on-island from off-island but in-state feedstocks or, in the case of waste, on-island sourced feedstocks.
- Priority 3: Fuels produced off-island but in-state with in-state feedstocks.
- Priority 4: Fuels produced off-island but in-state from out-of-state feedstocks.
- Priority 5: Fuels neither produced nor sourced on-island or in-state.

These priorities must be balanced with considerations of cost and usability for the desired appplication, such as drop-in fuels for transportation.

IMPACT & BENEFITS

A clear statement of the County's view of alternative fuels sustainability will set a precedent for future policy and project development both in the government and private sector. As a major fuel consumer, distributors may adapt their plans to be able to win county supply contracts. A desired effect of this is to give sustainable fuels the right starting momentum.

Proving that a given fuel meets the life-cycle energy requirement would be the responsibility of producers, distributors and retailers. Having this information

available will not only make it easier for the County to evaluate specific purchases, policies or projects, but also allow the broader community to make better decisions about fuel use. The broad definitions used here could apply to the oft-discussed biofuels, hydrogen and even electricity.

Measuring Success

The County will not initially be able to replace all fuels with alternative fuels, so the growth in use by county departments will need to be monitored. It will also be valuable to see if there is a relationship between County consumption of specific fuels and sales to public or business sector.

Key Indicators

- Consumption of alternative fuels by type
- Price of alternative fuels by type
- Modes of use of alternative fuels

Authority

The County Council can adopt blanket policies such as an alternative fuel priority policy by informal resolution as described in Rule 24 of the Rules of Procedure and Organization of the Council of the County of Hawai'i.

Timeline

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Establish a county-wide priority policy for alternative fuels.	$0			EP,DPW-A				
Develop reporting guidelines and documentation	$0			TE,SC,DPW-A				
Draft resolution	$0				TE,SC,DPW-A			

Resource Assessment	
Resources Available	▪ Sustainability Coordinator ▪ Energy Coordinator
Resources Needed	▪ Energy program manager ▪ Transportation energy position ▪ Energy Coordinator
Funding Sources	▪ No additional funding required
Responsible Groups	▪ County Council ▪ Mayor's Office ▪ Energy program staff ▪ Department of Finance ▪ Department of Public Works ▪ Other fuel purchasers

Risk Assessment	
Technical Feasibility	The life-cycle fossil-fuel balance of a fuel should be furnished by the supplier using County guidelines. This assessment can be difficult but is necessary to ensure that the County is choosing appropriate fuels.
Political Feasibility	There should be broad support for avoiding alternative fuels which are no better than fossil-fuels. Prioritization based on the location of sourcing and production may meet resistance from alternative fuel companies on other islands.
Community Support	Such a policy communicates support for local business and resources that may be well received by the community.

Adopt or develop a biofuels evaluation framework to support County decisionmaking and advocacy that addresses the specific needs of the island.

Background

The biofuels industry on the island is just beginning to develop, with a new biodiesel plant expected during 2012. However, supporting the industry is a key goal of state and county policy-makers. The potential of a biofuels production has stimulated interest and investment from landowners, project developers, community members, and government officials. Despite this enthusiasm, there is no coordinated biofuels policy, which means that each department or government body (state or local) proceeds in an ad-hoc basis with regards to new biofuels proposals. Given current zoning and land use law there may be little local control over potential biofuels development proposals on the Island.

In the last 10 years, there have been over a dozen studies and plans that recommend or prescribe actions related to biofuels development. One, the Hawai'i Bioenergy Master Plan, is a legislature-mandated document created by the Hawai'i Natural Energy Institute and is the largest such document guiding biofuels policy. Of the many goals of the Bioenergy Master Plan, one stands out in this context: "[Develop a] methodology for evaluation of bioenergy projects based on the principles of life cycle assessment (including energy return on investment) should be developed in consultation with relevant stakeholders." The anticipated completion date and submission to the Legislature was December 2011, though it is not listed in the Legislative Reference Bureau or the Legislature's database of reports received or referenced in DBEDT's 2011 Biofuels Study Interim Report. A second high-priority action was to "Establish policy and process whereby State agencies will require life cycle assessments for bioenergy development proposals that seek to use State lands or State funds." Similarly, no new information about this policy has been made available.

The heated controversy surrounding the proposed Aina Koa Pono biorefinery in Pahala is evidence the island should not wait and simply react *ad hoc* to proposed biofuels development projects as they arise. On the other hand, it is not helpful

for the government to decide in advance what feedstock or what processing technology should be used (unless the government is planning to finance a project now). Technologies improve over time, and advances in feedstock cultivation can enable techniques that were previously considered infeasible.

Because state-level policy-makers have either very narrow or very broad interests in potential biofuels development, the County of Hawai'i has an opportunity to take a leadership role in articulating what kinds of biofuels projects are desirable to the island's residents, and how project proposals will be evaluated going forward, given the county's powers and jurisdiction.

Few methods for systematically evaluating the sustainability of a biofuel have transitioned out of academic literature and into practice. The predominant biofuels certification schemes have emerged from the European Union as a result of the "Renewable Energy Directive."[86] The Directive requires that in order to be eligible for public financial support and to count towards renewable energy goals, a biofuel must be "sustainable." To qualify as "sustainable" a fuel must adhere to a set of sustainability criteria set out in the law. The categories include: greenhouse gas emissions; high biodiversity lands; and high carbon stock lands. The burden for compliance and reporting to the government is on the "economic operators" in the biofuel supply chain. Further, the law requires the executive European Commission to verify that the source countries comply with a number of human rights standards.

Rather than develop its own certification scheme the European Commission has decided to formally recognize independent schemes At least seven have been recognized to date from national governments, industry associations and other collaborations. Three such schemes aim to be potential international standards and are broader in scope than required by EU law: the International Sustainability & Carbon Certification scheme; REDcert; and the Roundtable on Sustainable Biofuels. The Roundtable has gone as far as to establish a US-based non-profit organization to aid in adoption of the scheme. These schemes are comparable to Forest Stewardship Council certification, which employs a network of certified professionals and procedures to guide the certification process. A number of organizations around the world have become official certifying bodies for the existing European schemes.

These schemes may not be readily applicable to Hawai'i, but at least provide a robust basis of documentation, certification and sustainability criteria. The HECO-NRDC[106] biofuel agreement from 2007 references the Roundtable on Sustainable Biofuels, but it was not as well developed at that time. The agreement relies on the similar Roundtable on Sustainable Palm Oil and sets a number of important criteria and priorites for selecting biofuels to be used in electric power generation. Thes criteria include:

- "HECO will preferentially purchase biodiesel from feedstocks grown in Hawai'i."
- "[T]he use of the land is in full accordance with the free, prior and informed consent of Indigenous Peoples and other customary users."
- "Plantations or crops shall not be established on land that was converted from natural ecosystems after 2005."
- "There is a clear, documented and verifiable chain of custody for all feedstocks."

RECOMMENDATION

Because the potential impacts of a biofuel-dependent economy are so far reaching, the stakeholder-focused development of a biofuels approval framework is recommended. The framework could be used for several different purposes including evaluating fuels for use in County operations, permitting processes, forming policy positions and project review.

Any final framework would ideally work for the entire state. If the County cannot successfully spur state action, it can alternatively coordinate with other county governments. Partnering with an organization experienced in biofuels certification to help guide the process would greatly enhnace it.

The first step of such a process should be to examine the suitability of existing certification schemes to Hawai'i. If necessary, working with the certification oversight organizations to develop supplementary Hawai'i-specific procedures would be a preferable next step. But unlike the adoption of building codes from published model codes, certification schemes are not made to be incorporated directly into local law. They remain independent and make use of approved third-party certifiers.

If no existing scheme is found to be suitable, the County can pursue developing its own. This will be more labor intensive in both the short and long term. Below are four recommended broad steps for developing a biofuels framework:

1. Assess biofuel needs by analyzing current liquid fuel demand on a physical and life-cycle basis.
2. Establish sustainability criteria through a stakeholder process. There will not always be a strictly quantitative way to evaluate all sustainability criteria. At some point there must be a decision on what is in the best interest of the island.
3. Assess available resources such as land and climate but not specific biofuel feedstocks. The goal should not to define and assess all possible feedstocks or conversion technologies unless the government

would like to become a biofuels producer

4. Establish a data collection, reporting and approval scheme. The most feasible approaches may be to employ self-reporting with review by a government agency or complete or third-party certification.

The most basic use of a biofuels evaluation framework for the County is for its own facilities and equipment. Much in the way LEED is required for state buildings, using an approved or certified biofuel would be a requirement for other government operations.

The County currently has little opportunity to review biofuels overall or for specific projects. The County Council can add biofuels processing facilities to the list of development types requiring a use permit under Section 25-2-61 of the County Code. The biofuels decision framework can be incorporated directly or by reference through the Code or the Planning Commissions' rules.

Any approval process must have mandated timeframes for County action so as to be predictable for project developers and keep the County accountable.

The alternative fuel tax scheme described in this section is another potential point of entry for evaluation through the framework. Eligibility for the low tax rate could be limited to those fuels certified and on file with the County.

Impact & Benefits

The question is not if biofuels will happen in Hawai'i, but how. If it desired, the County may succeed in blocking any new processing facilities, but it cannot reasonably prevent feedstocks from being grown. As one of the largest single potential biofuels customers, the County could strongly influence choices made about biofuels.

As is implied in the Bioenergy Master Plan, an effective biofuels approval framework is best implemented at the state level. Without additional changes to the law, the County only can control its own fuel purchases and its official statements of support. It cannot mandate that fuel distributors, major consumers (e.g. HELCO) or regulators (e.g. the PUC) use its framework. A state level framework development process would have to involve the non-Honolulu counties very closely because they are where biofuels feedstock production and processing are most likely to happen. In fact, it is best led by these counties. If the state is slow to develop the necessary policies, the County or counties can begin the process.

MEASURING SUCCESS

Because this process could take a number of different paths, measures of success will vary. At the most basic, developing a framework would be a major milestone. A positive stakeholder process is the most important first step. Next, successfully adopting or adapting an existing certification scheme.

At the county level, having the Council approve the framework and apply to all relevant areas of county jurisdiction is important.

Key Indicators

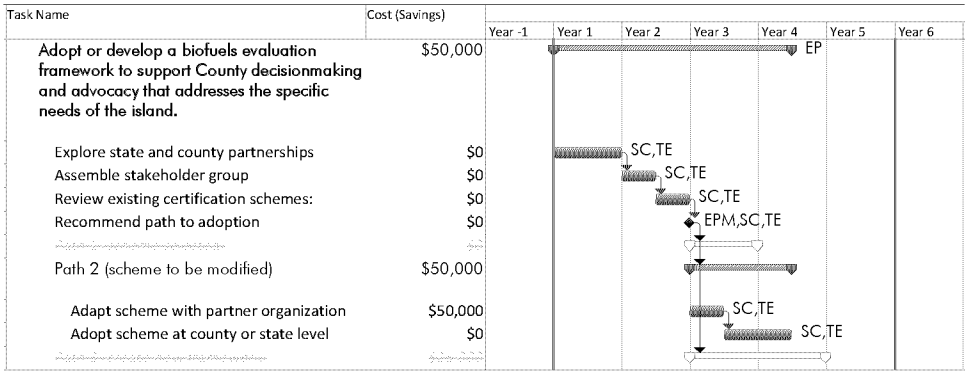
- Number of evaluations made
- Volume of approved fuels produced/sold
- Energy content of approved fuels produced/sold
- Percent of County energy demand met by approved fuels

AUTHORITY

The County may develop its own purchasing criteria through County Council action or administrative rule making as long as they do not conflict with the bidding and selection procedures required by state law. For use as an advocacy tool, a biofuels framework does not require any specific authority.

The County's procedure for use permits requires the Planning Commissions' review of a number of listed development types that are not specifically mentioned in state law. Chapter 25, Division 6 of the County Code does not refer to the state law for special permits (HRS §205-6). It seems that the County could add biofuels processing facilities to the list of development types that require special review, and then develop rules under the Planning Commission for permit approval. An analog to this occurs in land classified as "open" under the County's Zoning Code. While HRS §205-4.5 makes wind energy facilities a permissible use on agricultural lands, the County Code (25-2-61) says any wind energy facility on "open" land in an agricultural district must go through the use permit process.

TIMELINE



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Sustainability Coordinator ▪ Agriculture Specialist ▪ Planning Department ▪ Other counties ▪ Certification organizations
Resources Needed	▪ Energy & Sustainability Manager ▪ Energy Policy Analyst ▪ Stakeholder group ▪ Funding
Funding Sources	▪ Revolving energy fund ▪ General fund
Responsible Groups	▪ Energy program staff ▪ Planning Department ▪ Department of Research & Development ▪ County Council

Risk Assessment	
Technical Feasibility	Evaluating certification schemes or developing a new framework will require intensive coordination and supporting analysis from the participating counties. By allotting sufficient time, some of the burden may be reduced or transferred to a stakeholder group or through a contract with specialists. A partnership with a qualified non-profit could substantially ease adoption.
Political Feasibility	After many state and local plans and studies, there is a significant risk of planning fatigue. The potential technical complexity may also hinder political interest. A blanket pro-biofuels policy may be more palatable. Having the perception of slowing down politically desirable projects could also be a problem. Setting a strict review timeframe is very important to help alleviate this.
Community Support	The community could find great value in a longer more deliberate process than simple legislative or Council resolutions. The stakeholder process could gather many interests together for consensus-based decisionmaking.

INSTITUTE A FUEL TAX SCHEDULE FOR ALTERNATIVE FUELS.

BACKGROUND

Hawai'i County Council Resolution 109-07 sets the fuel tax for biodiesel and blends containing at least 20% biodiesel to zero. Only the City & County of Honolulu imposes a biodiesel tax (8.3 cents per gallon). All counties tax ethanol and methanol for highway use, with the County of Hawai'i having the lowest rate at 1.3 and 1.0 cents per gallon, respectively.[87] The County's current taxes on alternative fuels do not derive from a specific guiding policy.

Fuel tax revenues are allocated to the highway fund managed by the Department of Public Works. The state Department of Taxation data shows zero county revenue for the "other fuels" category, which includes biodiesel, methanol, ethanol, compressed natural gas and liquefied natural gas. This implies no fuel of these types, except possibly biodiesel, were sold in the county. In Resolution 109-07, the County Council found that removing the fuel tax from biodiesel would not have a significant impact on highway fund revenues. Taxes are collected and reported monthly in the Liquid Fuel Tax Base by the state Department of Taxation.

RECOMMENDATION

The County should create a comprehensive tax schedule for alternative fuels through an ordinance or formal resolution of the County Council. The tax schedule should be in agreement with the county policy on alternative fuels. The ordering of the suggested tax schedule below reflects the priority of different fuel characteristics, with the most desirable fuel characteristics listed first.

- Fuels produced on-island from on-island feedstocks : 0.0 cents per gallon.
- Fuels produced on-island from off-island but in-state: 1.0 cents per gallon.
- Fuels produced in-state from off-island but in-state feedstocks: 2.0 cents per gallon.
- Fuels produced in-state from feedstocks not sourced in the state: 5.0 cents per gallon.

- Fuels not produced in-state: 6.0 cents per gallon.
- Fuels that have net-positive fossil-fuel energy consumption on a life-cycle basis, including those that fall under the previous categories, should be taxed at the same rate as diesel and gasoline (8.8 cents per gallon as currently enacted).
- Fuels that are a blend of different fuels, including diesel and gasoline should be taxed proportionally the energy content of each component fuel, using the lower-heating value.

For the purposes of this recommendation "on-island" and refers exclusively to Hawai'i Island. "Feedstocks" are the materials which are directly converted into fuel by a production process.

The tax schedule should have a sunset clause, such as for 2020. If during this time the consumption of alternative fuels reaches a 10% share of total transportation energy consumption, the tax schedule should be modified to increase the tax on all but locally-produced, locally-sourced fuels. As the share of alternative fuels increases, the tax schedule should be reassessed at least annually.

The energy program staff would research and draft the appropriate reporting guidelines and documentation for fuel suppliers. Developing the requirements for life-cycle data reporting would require the most resources. It is important that this policy is coordinated with any evalutation frameworks for specific fuels (e.g. biofuels).

Impact & Benefits

In the near term, both sales the tax revenue are likely to be small. The policy would clearly communicate the County's policy on alternative fuels and its willingness to consistently apply it. With the scheme in place, fuel developers and distributers may choose one fuel over another for both present and future cost considerations.

Measuring success

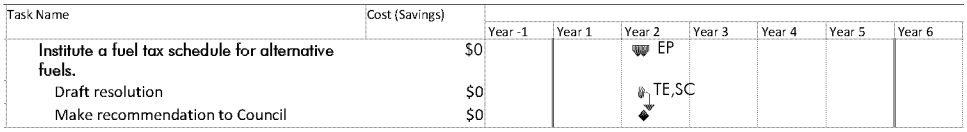
The County should track the growth in production and sales of alternative fuels on the island. Adjusting the tax based on future evaluations may be necessary. The County will not be able to analyze the economics of every possible fuel and every proposed project or supply contract. Thus it will be difficult to determine if the taxes have caused firms to switch to a lower-tax fuel.

Key Indicators
▪ Energy consumption of highway transportation by fuel
▪ Fuel sales by type

AUTHORITY

State law (HRS §243-5) specifies that taxes on alternative fuels "may be proportional to the energy contents of the fuels, as determined by their lower heating values, times one-half." This seems to allow room for a different metric for taxing alternative fuels. However, the same chapter provides for very specific disposition of fuel tax revenue and does not seem to allow for use as a subsidy. The only related use would be for mass transit under state "highway fund" provisions (§249-18). The barrel tax does direct money to the state energy systems development special fund (§304A-2169), but the disposition is left to the state Department of Business, Economic Development and Tourism.

TIMELINE



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Sustainability Coordinator
Resources Needed	▪ Transportation energy position
Funding Sources	▪ No additional funding required
Responsible Groups	▪ County Council ▪ Department of Finance ▪ Department of Public Works ▪ Energy program staff

Risk Assessment	
Technical Feasibility	The current reporting on sales volume for alternative fuels is uncertain. Calculating the appropriate tax escalation factor could be challenging.
Political Feasibility	Since the fuel tax on diesel and gasoline has not been increased since 1988, and remains much lower in Hawai'i County than in other counties, there may be some resistance to any perceived tax increase. However, if there is support for broad county-wide alternative fuels policies, then this could be seen as a natural extension. Also, the policy encourages more rapid adoption of alternative fuels which keep money within the local economy.

Community Support	The tax burden on individuals will be zero or negligible initially due to low fuel sales volume. There may be some resistance to increasing complexity of the tax schedule, however consumers do not pay or see fuel taxes directly.

DEVELOP A FRAMEWORK FOR INCREASING THE FUEL TAX ON FOSSIL FUELS AT A FUTURE DATE.

BACKGROUND

The original purpose of the fuel tax was not to discourage undesirable fuel types, but to provide a revenue stream for highway maintenance that is roughly proportional to usage. In current practice, it has become a combination of these two functions; no increases of the tax on fossil fuels has been approved since 1988,[88] but most alternative fuels are taxed at a lower rate.

Electric vehicles are notably exempt from fuel taxes even though they use the same roads as conventional vehicles. To this end, the Obama administration considered exploring mileage-based charges as an alternative way to provide revenue for highway maintenance, particularly if EVs become widespread.* The public utilities franchise tax defined by state law (HRS §240) is already allocated specifically to the highway fund by HRS §46-47. To offset the loss of fuel tax revenue, the state may choose to raise this tax as EVs are in wider use, possibly even in proportion to the amount of energy sold for vehicle charging.

Analysis and Recommendations for the Hawai'i County Energy Sustainability Plan from 2007 proposed a "feebate" for cars and light trucks which would increase the taxes or fees on less efficient vehicles to be used as a subsidy for more efficient vehicles. A similar proposal is to tax and subsidize the fuels directly.

Under current state law, neither proposal is feasible with current taxation and fee creation authority. HRS §243 specifies that the fuel tax collected by the state is retained by the state, and the fuel tax collected by counties is designated for the highway fund of each county. The County Council sets the fuel tax by formal resolution as allowed by Rule 24 of the Rules of Procedure and Organization of the Council of the County of Hawai'i. Under HRS §249-18. The highway fund is restricted to:

- roadwork;
- traffic control;
- street lights;

* Laing, K. "White House disowns plan to tax car mileage." May 5, 2011. http://thehill.com/blogs/e2-wire/e2-wire/159571-white-house-disowns-plan-to-tax-car-mileage

- police department (Honolulu only);
- mass transit; and
- bikeways.

The county fuel tax is outlined most recently in Council Resolution 504-08. In addition to gasoline and diesel (8.8 cents), there are also taxes on liquefied petroleum gas (2.9 cents), compressed natural gas (0.7 cents), and liquefied natural gas (2.5 cents) for highway use.

In 2010 the County's tax revenue from gasoline and diesel tax revenue was bout $7.6 million. At the City and County of Honolulu's tax rate of $0.165 per gallon the revenue would have been about $14.3 million, a $6.7 million increase.

The vehicle weight tax is also a candidate for a "feebate" program. The state legislature mandates the each county implement a weight tax with HRS §249-2 and HRS §249-13. Each county can set the level of the tax through the County Council, but it should be based on the net weight of the vehicle. Revenue from this tax is also designated exclusively for the highway fund by HRS §249-18, and so could not likely be used to subsidize energy efficient vehicles.

The County cannot create taxes not already created by the State Legislature according to Article VIII, Section 3 of the state Constitution. It can create fees, such as the vehicle registration fee. However, these fees must be directly related to a service provided by County, and not simply be punitive (HRS §286-51). Registration fees go to the General Fund.

RECOMMENDATION

Upon recommendation from the Mayor, the County Council should increase the fuel tax on highway fossil fuels by formal resolution when high-efficiency vehicles become widely deployed. The energy program staff should reassess the option every year and make a recommendation to the Mayor. Increasing the tax should not be considered until EVs and other high-efficiency vehicles are readily available and affordable for county residents. A key milestone should be when 5% of new vehicles sales are high-efficiency vehicles, including EVs, PHEVs, hybrids, and fuel cell vehicles but not including flex-fuel or other internal combustion engine vehicles.

The level of the tax should be set so that a clear price signal is sent to consumers of fossil transportation fuels, without overburdening individuals and households.

If any of the state restrictions on the use of fuel tax revenue have changed when this action is reconsidered, the increased revenue should be directed to a new fund to provide a subsidy to residents and businesses for electric or other high-efficiency non-fossil vehicles or the fuel used in those vehicles.

Impact & Benefits

A clearly defined schedule for increasing fuel taxes may allow consumers to anticipate the rising costs and influence their vehicle purchasing decisions. Recent research suggests that in the long run, consumers will purchase significantly less fuel and travel fewer miles as fuel prices rise.* Increasing the county fuel tax to $0.165 (O'ahu), could cause an approximately 1% decline in fuel consumption. Similarly, an expectation of rising demand may cause dealers to purchase more high-efficiency stock.

The significant increase in funds available to the County could only be used for the specific purposes defined for the highway fund. Both mass transit and bikeways can have important energy savings and would be allowable uses. More simply, the new revenue may allow other highway fund revenue sources to be moved to the general fund, if not otherwise restricted. This would not be the case with the proposed 2011-2012 operations budget, but could apply to the capital budget.

Because this tax runs the risk of being regressive, that is disproportionately affecting those with a lower ability to pay, the increased funds should at least in part be set aside to assist low-income residents in the fuel transition.

Measuring success

The only direct evidence of success would be obtained through consumer surveys. It may be possible to measure a relationship between increasing fuel taxes and decreasing fuel consumption over time. A reduction in fuels sales vehicle-miles traveled per capita are other indirect indicators of progress, but the effect of the fuel tax may be impossible to separate from other factors.

Key Indicators

- Fuel consumption by type
- Fuel sales
- Fuel tax revenue
- New vehicle sales by type
- Average cost of energy for vehicles by type
- Vehicle stock fuel economy
- Vehicle-miles traveled
- Vehicle-miles traveled per capita

Authority

HRS §243-5 grants the County Council the authority to set the fuel tax by resolution. No limit is placed on the level of the tax. The County cannot change the public utilities franchise tax.

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* Litman, T. (2011). *Changing Vehicle Travel Price Sensitivities: The Rebounding Rebound Effect*. Victoria Transport Policy Institute. www.vtpi.org

TIMELINE

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Develop a framework for increasing the fuel tax on fossil fuels at a future date.	$0		EP					
Establish calculation method for tax level	$0		TE,DFin					

Resource Assessment	
Resources Available	▪ Sustainability Coordinator ▪ Energy Coordinator
Resources Needed	▪ Energy program manager ▪ Transportation energy position
Funding Sources	▪ No additional funding required
Responsible Groups	▪ Energy program staff ▪ Mayor's Office ▪ County Council ▪ Department of Finance

Risk Assessment	
Technical Feasibility	It will be challenging to determine the appropriate tax rate to disincentivize fossil-fuel use without prematurely overburdening vehicle owners.
Political Feasibility	Since the fuel tax on diesel and gasoline has not been increased since 1988, and remains much lower than in other counties, there may be some resistance to any perceived tax increase. The situation should be reassessed annually with a recommendation to the Mayor.
Community Support	If the tax is raised significantly before high-efficiency vehicles are affordable and available and mass transit ridership is greater, the community will not respond well.

Implement a Complete Streets policy to improve the safety and accessibility of the island's public roadways.

Background

The State of Hawai'i passed a law in 2010 that established the Complete Streets Task Force (CSTF) to examine existing roadway design standards. The CSTF was established to help the state meet the requirements of HRS §264-20.5, which requires the incorporation of complete streets principles during the maintenance and and new construction of the public roadways throughout the state. The law contains four exceptions where complete streets are not required:

- pedestrians or bicyclists are prohibited by law;
- the costs would be excessively disproportionate to the need or probable use of the particular roadway;
- it is unlikely bicyclists or pedestrians will ever use the roadway; and
- complete streets would actually decrease the safety of vehicular, pedestrian, or bicycle traffic.

A "complete street" is a transportation facility that is planned, designed, operated, and maintained to provide safe mobility for all users, including bicyclists, pedestrians, transit riders, movers of freight, and motorists appropriate to the function and context of the facility. The goals of complete streets are to improve the quality of life, environment, and livability of Hawai'i's communities. These design principles are intended to improve roadway safety and mobility for all.[91]

Complete streets principles are consistent with the policies and goals of the Hawai'i County General Plan, which has several provisions related to accessible and efficient transportation systems. In addition, the Hawai'i Island Long Range Land Transportation Plan has several major objectives related to developing multi-modal transportation elements.[107]

In 2011, the Hawai'i County Council passed a resolution requesting the Department of Public Works prepare a Complete Streets policy.[90] The policy is currently under development by the department.

RECOMMENDATION

The County of Hawai'i should implement a complete streets policy to improve the safety and accessibility of the island's public roadways and comply with state law. The policy should also adhere to transportation planning goals and policies in the County General Plan and Community Development Plans.

The State of Hawai'i Complete Streets Task Force guidelines provide a good model and should be adopted by the Department of Public Works and the Department of Planning when considering new development projects and the routine construction and maintenance of County roadways.

The guidelines developed by the CSTF recognize that transportation planning and individual project development is particularly sensitive to context, thus blanket requirements are often not appropriate in all cases. The complete streets principles are intended to be flexible enough to be tailored to most projects, and can be implemented on a spectrum from simply restriping existing roadways up to reconstructing entire roadways to more safely accommodate bicycles and pedestrians.

Adopting this policy will require the coordination of work by the Administration, Engineering, Traffic, and Highway Maintenance Divisions inside the Department of Public Works. The energy program staff should assist the various divisions in prioitizing roadways throughout the island for improvement.

Not all roadways throughout the island are suitable for improvement to complete streets standards, so the Department of Public Works should be responsible for determining whether a new or reconstructed roadway should not be built according to the policy. The Department's decisionmaking on this matter should be completely transparent and specifically reference which of the four exceptions in HRS §264-20.5 is being applied. Likewise the Department should determine the priority of implementation for existing roadways.

IMPACT & BENEFITS

Over time, the expansion of alternative transit options on the island will decrease transportation energy demand, which reduces the amount of energy that must be generated from renewable sources to achieve the island's energy goals.

The cost of modifying existing streets to be more accessible to pedestrians and bicyclists will vary depending on the terrain and features on either side of the

existing roadway. In some cases, modifying an existing roadway will be impractical.

Incorporating complete streets principles into new construction is considerably less expensive than modifying existing infrastructure. One estimate put the cost of a full complete street (separate lanes for bicycles, pedestrian sidewalks, and barriers between vehicle traffic) at 10-20% of the cost of new construction.

MEASURING SUCCESS

The energy program staff can work with the Department of Public Works to tabulate the extent of complete streets implementation throughout the island.

Key Indicators

- Miles of roadway construction or maintenace built to CSTF standards as a percentrage of total roadway construction or maintenance
- Total miles of bike lanes as percentage of public roadways
- Percent of total population living within 1/4 mile of a Complete Street

AUTHORITY

HRS Section 264-20.5 requires the County to reasonably accommodate convenient access and mobility for all users of the public highways, including pedestrians, bicyclists, transit users, motorists, and persons of all ages and abilities.

The statute applies to new construction, reconstruction, and maintenance of highways, roads, streets, ways, and lanes located within urban, suburban, and rural areas.

In addition, court decisions in Hawai'i have established that a government has a duty to keep its highways in safe condition, and that the state has a duty to maintain its highways safe for travel, if it allows them to remain open.[108]

TIMELINE

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Implement a Complete Streets policy to improve the safety and accessibility of the island's public roadways.	$0		EP,DPW,DPlan					
Draft revision of subdivision code and zoning code	$0		DPlan,TE,SC					
Make recommendation to Council	$0		EPM,DPlan					

Resource Assessment	
Resources Available	▪ Energy coordinator ▪ Department of Public Works ▪ Planning Department
Resources Needed	▪ Energy program manager ▪ Transportation energy position
Funding Sources	▪ The County allocates about $40M per year for transportation system maintenance and construction. A portion of this amount can be utilized to incorporate Complete Streets into existing and planned roadways. ▪ In addition, the Highway Fund receives more revenue each year than is currently spent on the transportation system. A portion of unspent funds can be allocated to Complete Streets projects.
Responsible Groups	▪ Energy program staff ▪ Department of Public Works ▪ Department of Planning

Risk Assessment	
Technical Feasibility	Technical barriers to walkability and bikeability typically involve the terrain and geographic features of the land on either side of an existing or planned roadway. Other barriers include inadequate public easements for street enlargement. Only a fraction of existing roadways face these challenges, and planned roadways must conform to the subdivision and zoning codes, which require adequate road easements.
Political Feasibility	There may be some resistance to the expense of complying with state law.
Community Support	Community members are likely to be supportive of complete streets, since they are shown to improve pedestrian and vehicle safety, and they allow increased mobility at lower operator cost than conventional transit options.

ENFORCE THE STATE LAW REQUIRING LARGE PARKING LOTS TO PROVIDE ELECTRIC VEHICLE PARKING AND CHARGING.

BACKGROUND

State law (HRS §291-71) mandates that public, private and government parking lot owners with at least one lot containing 100 spaces set aside at least one space for electric vehicles, and provide one or more charging stations by July 1, 2012. The law does not specify if the power supplied at the charging station should be free of charge. Given that there are only seven sites on the island with public charging stations according the DBEDT, it does not seem that all possible sites are in compliance with the law.

The related HRS §291-72 allows warnings to be issued to people who park conventional vehicles in EV-designated spaces starting in January 2012. The warnings will be replaced by fines ranging from $50 to $100 starting in July 2013.

When the law was first created in 2009 by Act 156, it required that parking lot owners with at least once lot containing 100 spaces set aside 1% of their total spaces for electric vehicles, and provide one or more charging stations. Further, it stated that when 5,000 EVs are registered in the state, the requirement will increase to 2%, and increase by 1% for each addition 5,000 EVs registered, until it reaches 10%. It also required that the designated spaces be near the building entranceThe law was changed to its current form by Act 98 in 2012.

RECOMMENDATION

The Mayor should direct the relevant permitting departments, including Public Works and Planning, to suspend the processing of permits for applicants who are found to be out of compliance with HRS §291-71. Relevant inspectors and auditors should include a check for compliance in any inspections or site visits. If a site inspection or other visit is not already planned for the permit application in question, it is not necessary to add one just for the purpose of enforcing this policy.

As more EV parking spaces become available, the energy program staff should track the number of complaints about violations of HRS §291-72.If necessary, the Office should recommend to the Mayor that the Police Department, or

other relevant agency, enforce the fine.

The energy program staff should make an assessment of parking lots to determine which fall under the requirement. It may be necessary to compile a list of existing parking lots and available spaces.

Impact & Benefits

Having charging stations at major destinations will increase the visibility of EVs both by standing alone, and drawing EV drivers to those sites.

Measuring Success

The County should request usage data from local businesses to assess the preferred travel patterns of EV drivers. Other valuable metrics are the number of stations installed and the number businesses served by each station.

Key Indicators

- Number of charging stations installed
- Location of charging stations
- Number of designated EV parking spaces
- Fines/warnings issued

Authority

HRS §291-71 does not explicitly grant authority for enforcement to the counties, but building and land use permits are overseen by the county. HRS §192-72 classifies parking a non-electric vehicle in a designated space as a traffic infraction, which would be enforced by the County's Police Department.

Timeline

Task Name	Cost (Savings)
Enforce the state law requiring large parking lots to provide electric vehicle parking and charging.	$0
Council resolution	$0
Employee training	$0
Assess parking lot stock	$0
Establish forms and processing	$0

Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Department of Public Works
Resources Needed	▪ Transportation energy position ▪ Employee training
Funding Sources	▪ No additional funding required

Responsible Groups	▪ Mayor's Office ▪ Energy program staff ▪ Department of Public Works ▪ Planning Department ▪ Department of Finance ▪ Police department

Risk Assessment	
Technical Feasibility	There may be no list of existing parking lots that fall under the requirement, or of parking lot capacity in general. Determining the requirement for owners of multiple lots will also be difficult for this reason.
Political Feasibility	The parking space designation is required by law. If there is a conflict with state-level enforcement, the County should not take action.
Community Support	Increasing the visibility of EV infrastructure is important for community support. However, the enforcement process will be largely out of sight for most community members.

Reduce fossil-fuel consumption in the County fleet through vehicle purchasing and a fleet management system

Background

Vehicles are critical for the services the County provides to island residents. There are over 1,500 vehicles currently in the County's fleet (this figure includes more than 400 privately-owned vehicles fueled by the Police Department). The County fleet consumed about $7.5 million in fuel in fiscal year 2011. However, beyond the aggregate purchases captured by the Department of Finance, there is no system in place intended to track fuel volume, energy consumption, or efficiency for the fleet.

The Department of Water Supply recently initiated the contracting process for a GPS-based fleet management and fuel tracking system. The initial pilot would be used to manage 15 vehicles on a two year service contract. The pilot is limited to DWS because it is a semi-autonomous agency within the County with its own budgeting process and separate vehicle fleet.

The Green Government Action Plan recently examined the options for improving County fleet management. Its recommendations fall under three categories:

- Fuel conservation and monitoring
- Fuel economy and fleet optimization
- Alternative fuels standard

The County now has five plug-in electric vehicles for use by several departments. The decision to pursue electric vehicles is backed up by an analysis conducted by the National Renewable Energy Laboratory (NREL).[92] The report estimates that replacing the SUVs currently used for passenger transportation with electric vehicles could save the County $1,600 every year per vehicle. The important comparison between conventional vehicles and electric vehicles is not the absolute cost for a new EV, but the marginal cost for a vehicle that would have been replaced anyway. The County is also planning to replace or eliminate the most inefficient and underutilized vehicles first. However, due to budget limitations, the County plans to purchase only 10 new vehicles in FY2012 – 2013, as compared to the 98 purchased during FY2007 – 2008.

These savings idenfitied by NREL are contingent upon using electricity from a solar PV array such as the one at the West Hawai'i Civic Center. That array alone could charge an estimated 30 vehicles. There are currently three charging stations with a total six vehicle capacity funded by Better Place, Inc., a private electric vehicle infrastructure company. The Department of Public Works recently awarded a contract to install charging stations at the Aupuni Center in Hilo. The chargers are expected to be Level 2, meaning that plug-in hybrid vehicles could be charged in three to four hours.

Fleet management systems which track mileage, fuel consumption and even specific route and use data are widely available in the market. Fuel savings are achieved through reduced idling, reduced speeding and other user behaviors as well as through better vehicle maintenance scheduling.

The Green Government Action Plan estimates that a fuel management system would pay for itself in one to three years. In parts of the United States with lower fuel costs, the payback may be be as long as five years.[109,110] The Aberdeen Group reports that fuel cost and operating savings of over 20% per year have been seen by other organizations that have begun a GPS-based management.[111] HELCO reports similar savings with its own system.

RECOMMENDATION

The County is already on the right track for reducing the energy consumed by its vehicle fleet. The current efforts should be consolidated into a unified policy to be overseen by the energy program staff. Below are highlights of such a policy.

- Collect and analyze the fuel volume and energy content of the fleet on regular basis. This will likely require a third-party to supply the County with a modern fleet data management system including fuel consumption, mileage and GPS tracking. The usefulness of such a system can be evaluated with the success of the vehicle tracking pilot in the Department of Water Supply. The cost savings from the fleet management system be can put towards future electric vehicle and alternative fuels purchases via the revolving fund.
- To save costs, existing vehicles do not need to be retired prematurely just so they can be replaced with high efficiency or electric vehicles. Going forward, any new vehicle purchased should have the effect of increasing the fleet wide fuel economy. In passenger applications, electric vehicles should have priority. Where electric vehicles are not feasible, the next most important consideration is fuel efficiency for internal combustion engine vehicles regardless of technology (e.g hybrids). The vehicles must be capable of accepting biofuels available on the island.
- When purchasing biofuels, the County should adhere to the Alternative Fuels Priority Policy describe in this Roadmap. Whenever financially and

technically viable, renewable alternative fuels should be purchased instead of petroleum fuels.

- Once the relevant data is available, creating a centralized motor pool for County employees may allow electric and high efficiency vehicles to be used more often than if assigned to individual employees. In the absence of such data, the County should deploy the vehicles to users who have the highest light-duty driving needs.

Impact & Benefits

Prioritizing electric vehicles will be the most cost effective approach. A National Renewable Energy Laboratory (NREL) study showed that replacing 25% of the WHCC fleet with electric vehicles would save over $130,000 in fuel costs over six years. Other alternative fuels may not be lower cost than petroleum fuels. There are no currently available drop-in replacements for gasoline available in Hawai'i. A longer-term purchase contract for alternative fuels could be used to support the development of new production facilities on the island.

A 20% savings in fuel for county vehilces could amount to over $1.5 million per year, but based on other available information a lower bound of 10% savings is used for this plan.[111,112,113]

Measuring success

The fleet management system vendor should be able to provide detailed data and analysis of fleet operations and fuel consumption. The County should look for decreases in fuel consumption and mileage, and track the utilization rate of individual vehicles.

The number of electric vehicles in the fleet should steadily increase. If all new passenger vehicles are electric, the program will be a huge success. For vehicles that cannot be electrified, successfully securing a reliable supply of drop-in alternative fuels will be the first step to a complete fleet conversion.

Key Indicators

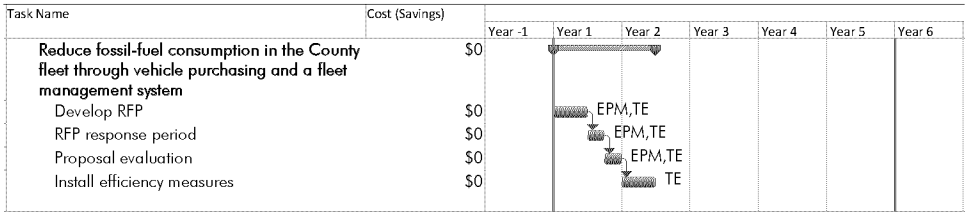
- Number of vehicles, by type
- Fuel consumption, by type and vehicle
- Fuel cost, by type and vehicle
- Vehicle miles traveled
- Vehicle utilization
- Maintenance costs
- Vehicle down-time

Authority

The County directly manages its purchases of equipment and fuel through bidding and contracts. The procurement process is regulated by state law (Chapter 103D of the Hawai'i Revised Statutes).

TIMELINE

Note: Costs are not included in the timeline to avoid double counting (costs are included in the Revolving Fund). These costs are accounted for in the overall five-year cash flow included in the Five Year Roadmap.



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Department of Finance, Purchasing Division ▪ Department of Public Works, Automotive Division
Resources Needed	▪ Energy program manager ▪ Transportation energy position ▪ Fuel management vendor ▪ Funding
Funding Sources	▪ Revolving Energy Fund (savings) ▪ General Fund (savings) ▪ Highway Fund (savings)
Responsible Groups	▪ Energy Coordinator ▪ Department of Finance, Purchasing Division ▪ Department of Public Works, Automotive Division

Risk Assessment	
Technical Feasibility	The County fleet is small enough to realistically be powered entirely by renewable energy sources. Most current vehicles fall in the light truck, van and SUV category. There are no commercial vehicles on the market today that could replace these vehicle types. However, in the County, many are used for passenger transport and so could be replaced by electric vehicles. Nevertheless, there will likely be a segment of the fleet that cannot be electrified, indicating that alternative fuels are necessary to completely stop fossil-fuel use.
Political Feasibility	The simple cost-benefit analysis shows that fleet management and efficient vehicle purchasing can save money. Savings from fleet management can be redirected to vehicle purchases as the fleet is gradually replaced.

Community Support	The community may be sensitive to the upfront cost of this action, but if the savings are clearly demonstrated support is likely. Explicitly expressing a priority for alternative fuels that are appropriate for the island could also ease acceptance.

Encourage County employees to use an existing free private platform for carpooling and ridesharing.

Background

Carpooling and ridesharing are similar strategies for reducing the number of people driving personal cars. Carpooling typically refers to a regularly recurring arrangement, such as a group of employees commuting together. Ridesharing is less restrictive as neither the origin and destination nor the ridership is necessarily recurring.

Dynamic or real-time ridesharing is a service that allows carpooling to be quickly coordinated between riders and ride providers. Both carpooling and ridesharing services are being established in the private sector but are not yet widespread. The services are web-based and take advantage of a number of technologies including mobile internet access, GPS tracking and social networking.

The services typically not restricted to specific geographies. However, some offer customized private portals for the service that can have a geographic focus and regulated user access. A number of universities have taken advantage of these features to protect student safety.

Recommendation

The energy program staff should manage the adoption of a voluntary ride-sharing program for county employees as a model to be expanded to all island residents. An existing free or low-cost service can be utilized instead of creating a customized portal with an service provider.

To make the process simpler to administer, the project should initially be piloted at a specific County facility or building, such as the West Hawai'i Civic Center. The program could then be expanded to buildings of sufficient size (e.g. 15 or more full-time employees).

Incentivizing employees to use the service is probably necessary to encourage adoption. Possible strategies include:

- Priority parking for carpool vehicles
- Public acknowledgement of success, i.e. via newsletter or bulletin

board.

- Friendly competition between departments, offices, buildings or other natural groups
- Rewards for high achievement. For example, a carpool group that successfully carpools together for one month will receive a paid lunch for the group. Budget: $1,000

The program is best administered by the energy program staff. Other organizations may also be included in the program, such as the University of Hawai'i-Hilo, resorts, hospitals and shopping centers.

Impact & Benefits

The immediate effect of this program is not certain. The intent is more to assess the workability of a rideshare program for the island. If the program is not a success, there will be valuable information for other similar programs.

Measuring success

The small incentive pool will encourage participants to report their involvement. Especially for the small initial pilot, success will be any increase in rides shared.

Key Indicators

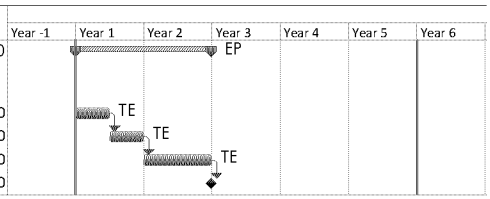
- Number of participants/groups
- Number of rides saved
- Number of VMT saved

Authority

No specific authority seems to be required for this internal County program. It should be confirmed that financial rewards for participants (e.g. a paid lunch) do not violate County policy.

Timeline

Task Name	Cost (Savings)
Encourage County employees to use an existing free private platform for carpooling and ridesharing.	$1,000
Program design	$0
First pilot	$0
County-wide pilot	$1,000
Decision to continue	$0



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Sustainability Coordinator
Resources Needed	▪ Transportation energy position
Funding Sources	▪ Revolving energy fund
Responsible Groups	▪ Energy program staff

Risk Assessment	
Technical Feasibility	There could be some initial challenges setting up a system to track the participation in the program. An honor-system process would have the lowest implementation barriers.
Political Feasibility	As an internal county program intended to save energy with little to no cost, there no resistance is expected to the concept. If the participation tracking system proves too complex, managers may not be interested.
Community Support	Since the program would not involve or affect non-employees, no resistance anticipated.

Renewable Electricity

Renewable Electricity | Promote appropriate energy development and use

Devote additional resources to representing the County's interest in Public Utilities Commission proceedings

Background

Proceedings before the Hawai'i Public Utilities Commission (PUC) are formal, public, quasi-judicial areans where major electricity policy and regualtory matters are decided. The County is a large consumer of electricity and has a substantial interest in representing itself and the interests of its citizens before the PUC. These decisions go far beyond setting fair electric rates for customers. Since the Hawai'i Clean Energy Initiative began in 2008, the pace and complexity of change in government regulation of the electric power sector has increased rapidly. The outcomes of these dockets will have far-reaching ramifications for the energy future of the island. There are dozens of electricity-related dockets currently open, and several of these warrant participation by the County of Hawai'i.

The County has recently increased the level of participation in proceedings before the Public Utilities Commission, including the Intra-governmental Wheeling and Reliability Standards dockets. There are generally three ways for an organization such as the County to be involved in a docket: 1) as a party to the docket; 2) as an intervenor; and 3) as a participant. The parties are typically the regulated company, the consumer advocate and any other group specified by the PUC (e.g. The County of Hawai'i is a party to Docket #2010-0037, Energy Efficiency Portfolio Standards). Applying to be an intervenor is effectively asking to be considered a party to the docket. Parties to the dockets may be required by the PUC to submit information or perform other actions. Parties may also make information requests of other parties. Participants are also applicants but do not have the same level of participation as intervenors. They do generally have acess to material which my be redacted for the general public.

RECOMMENDATION

The County should devote additional resources to participation in Public Utilities Commission proceedings including new staff, legal consultants and additional energy policy-related experts.

The County should maintain active participation in the Intra-governmental Wheeling and Reliability Standards dockets. Participation should be expanded to include the upcoming HELCO 2013 Test Year Rate Case, the Energy Efficiency Portfolio Standards docket, and the Integrated Resource Planning docket.

IMPACT & BENEFITS

It is difficult to precisely measure expected impacts of participation in PUC dockets. Without effective contributions, however, the County could see its interests compromised due to competition for limited resources or failure to incorporate the specifics of Hawai'i Island into state-level decision-making.

MEASURING SUCCESS

Assessing the results of docket participation is qualitative and subjective, particularly in the more complex dockets. The County needs to understand its own goals for each of the dockets individually to see if the desired outcomes are achieved. Broadly, the result of each docket should work towards the guiding principles outlined in this plan.

Key Indicators

- Number of dockets participated in
- Qualitative goals achieved, per docket

AUTHORITY

The County is responsible for ensuring the orderly and appropriate development of the island. As a large consumer of electricity, it has an additional financial interest in PUC decisions. The County has already participated in a number of dockets, which requires an application to the PUC. Hawai'i Administrative Rules allow County participation at the PUC's discretion.

TIMELINE

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Devote additional resources to representing the County's interest in Public Utilities Commission proceedings	$0							EPM,EC,

Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Corporation Counsel ▪ Non-profit docket participants ▪ Consultants
Resources Needed	▪ Energy program manager ▪ Consultants ▪ Additional training for County attorneys
Funding Sources	▪ Revolving energy fund
Responsible Groups	▪ Energy program staff

Risk Assessment	
Technical Feasibility	Participation in the dockets can require in depth analysis particularly if the County is an intervenor or official party and not just a participant. The parties are allowed to request information from each other. The more experienced parties may also submit extremely large amounts of information to the dockets that may require extensive review. A number of issues covered by the dockets are highly technical in nature and can only be understood by experts. Having sufficient county expertise will make docket involvement more effective. Retaining outside consultants is also a possible strategy for the high-priority proceedings.
Political Feasibility	The energy program staff's analysis and recommendations may not always align with political priorities.
Community Support	The community will likely support effective participation in PUC dockets if the results are more favorable decisions for island residents.

Introduce an expedited permitting process for small solar photovoltaic systems.

Background

There are currently no readily available informational resources from the County on how to apply for all the necessary permits for solar thermal or solar PV installations. Any PV installation will require an electrical permit and a building permit. A solar thermal installation will additionally require a plumbing permit.

Navigating this system of permitting may be particularly challenging for an owner-builder. It requires familiarity with the electrical code, building code and possibly the plumbing code. An owner-builder cannot file electrical and plumbing permits without the signature of a licensed professional.

Given the similarities between most residential solar PV systems, the permitting process for these installations is unnecessarily long and complex. The Department of Public Works has already begun reviewing its permitting procedures with an aim to reduce processing time. The Solar America Board for Codes and Standards (Solar ABCS) has developed an expedited model permitting process that it estimates would apply to 50-75% of systems under 15kW.[114] The basic technical requirements for a system to be eligible for the expedited process are that:

- "the array is mounted on a code-compliant structure;
- an engineered mounting system is used to attach the array to the structure; and,
- the array has a distributed weight of less than 5 lbs./ft2 and less than 45 lbs. per attachment."

The electrical requirements are that:

- "all products are listed and identified for the application (i.e. modules, inverters, source combiners, etc.);
- the array is composed of 4 series strings or less and,
- the inverter output is 13.44 kW or less (maximum size for 70-amp breaker) and is connected on the load side of the service disconnect."

The model ABCS permit itself walks the user through all of the requirements and provides all the necessary forms. The materials that must be submitted with the permit are the site diagram, the standard electrical diagram and the equipment

specification sheets. San Jose, California has adopted a permitting process based on the one developed by Solar ABCS.

RECOMMENDATION

The Department of Public works should review the model expedited solar PV permitting process and make a recommendation to the County Council for adoption. Additional modifications to the expedited permitting process include:

- **A Clear and simple fee schedule with a single application fee for the expedited permit. The fee should be set so as to adequately account for staff time.**
- **Priority processing and a guaranteed response time for filed permit.**
- **A narrow inspection timeframe to reduce contractor labor costs to the customer.**
- **Recording and reporting of rated system capacity to a central database.**

IMPACT & BENEFITS

The improved permitting process reduces the burden on the contractor more than the system owner. However, the customer will likely save money from reduced labor time from permit and supporting information writing.

MEASURING SUCCESS

The number of applications filed under the expedited process will be interesting to monitor. Since solar installations have been generally increasing for several years, it may not be possible to quantitatively assess the impact of improved permitting. A brief survey of contractors may help to understand the value of the process.

Key Indicators

- Solar installations
- Applications to expedited permitting
- Capacity of systems

AUTHORITY

The County currently sets the permitting process in the building code, electrical code and plumbing code. It can be changed by Council ordinance.

TIMELINE

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Introduce an expedited permitting process for small solar photovoltaic systems.	$0		EP,DPW-B					
Review and adapt model permitting process	$0		EC,EPM					
Make recommendation to Council	$0		EPM					

Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Department of Public Works ▪ Model permitting documents ▪ Solar America Board for Codes and Standards
Resources Needed	▪ Training for Department of Public Works employees
Funding Sources	▪ No additional funding necessary
Responsible Groups	▪ Department of Public Works, Building Division ▪ Energy program staff

Risk Assessment	
Technical Feasibility	The process is already laid out for review. Confirming that the standard electrical diagram is suitable for the County may require the most effort.
Political Feasibility	Streamlined permitting is often seen as a good way to promote renewable energy projects.
Community Support	Most end-users of the permitting process would be island residents. There is broad support for solar PV in the community.

INSTITUTE A COUNTY-LEVEL REVIEW PROCESS FOR GEOTHERMAL EXPLORATION AND DEVELOPMENT THAT INCLUDES A PUBLIC HEARING AND ENSURES A PROJECT IS NOT "MATERIALLY DETRIMENTAL TO THE PUBLIC WELFARE"

BACKGROUND

The current County and State administrations have both supported the pursuit of geothermal development as a critical component of energy sustainability for Hawai'i Island. To this end, HELCO issued a request for information for a 50MW geothermal plant in 2011 and received authorization to proceed with a more specific request for propsals from the Public Utilities Comission in May 2012 through Decision & Order 30360 in docket #2012-0092.

The Geothermal Working Group was created by the County of Hawai'i in reponse to Senate Concurrent Resolution 99 in 2010. The purpose of the Working Group is "to analyze the potential development of geothermal energy as the primary energy source to meet the baseload demand for electricity on the Big Island." As outlined in its final report in 2012, the Working Group found that geothermal energy has the potential to be "the cheapest form of baseload power for Hawai'i County" while also having a lower environmental impact than conventional power generating facilities.[64] While generally supportive of geothemral development, the report emphasized a need for ongoing attention to public safety, environmental, and community concerns while recognizing that impacts are site-specific. The report specifically recommends further investigation into air quality and noise impacts.

The current Planning Commission rules that govern geothermal resource permits are based on the designation of Geothermal Subzones. In May 2012, Act 97 of the state legislature eliminated Geothermal Subzones by repealing HRS §205-5.1. This law effectively eliminates the County's current geothermal approval process. Instead, geothermal exploration and development will be permissible uses in conservation, rural, urban, and agriculture districts which account for almost all

land other than those managed by the Department of Hawaiian Homelands.* The County of Hawai'i only has planning oversight for lands in the rural, urban and agricultural districts (48% of land area) while the state Department of Land and Natural Resources oversees conservation district lands (52% of land area).[22]

The new law does does not alter the requirement under HRS §343-5 for a power generating facility project to conduct an environmental assessment and, if necessary, a full Environmental Impact Statement (EIS). However, in repealing HRS §205-5.3 it removes the requirement for exploratory drilling to follow the environmental requirements of HRS §343.

According to the rules created by the State Environmental Council (HAR §11-200-17) the EIS currently required under HRS §343 must include a discussion of the the proposed action's impact on health and safety. If the proposed action "substantially affects public health," then the action should not proceed without modification (HAR §11-200-12). However, the Environmental Council does require a specific methodology to evalute the health impact.

A Health Impact Assessment (HIA) is a methodology that is similar to an EIS and has successfully been integrated into the EIS process in several jurisdictions. The HIA process is less well established than the EIS, but has gained support and recognition from the Centers for Disease Control,[115] The U.S. Department of Health and Human Services,[116] and the World Health Organization.[117]

The current Planning Commission rules (No. 11) govern the geothermal resource permit procedure, but with the new state law they would not be used without some change in the County Code. The procedure is much more prescriptive than for a special use permit, as briefly discussed below. The geothermal permit process would require a public hearing and possibly a separate mediation process open to any applicant before the Commission makes a decision. "The Commission shall grant a geothermal resource permit if it finds that the applicant has demonstrated that:

- "a) The proposed geothermal development activities would not have unreasonable adverse health, environmental, or socio-economic effects on residents or surrounding property; and
- b) The proposed geothermal development activities would not unreasonably burden public agencies to provide roads and streets, sewers, water, drainage, school improvements, and police and fire protection; and
- c) There are reasonable measures available to mitigate the unreasonable adverse effects or burdens referred to above."

* A similar issue occurred with a proposed biofuels production plant near Pahala. Under HRS §205-4.5, biofuels processing facilities are permissible on agricultural lands.

A mining lease would also be required for geothermal development, and can only be issued by the state Board of Land and Natural Resources under §182-5.

Plan approval is the Planning Department's primary method of review for new construction. Currently, development on agricultural lands does not require plan approval unless it falls under one of the categories listed in Section 25-2-71. Geothermal exploration and development are not listed. The plan approval process does not include public hearings.

The Zoning Code defines the specific cases in which a use permit must be obtained from the Planning Commission (County Code 25-2-61). The process requires a public hearing. This section could be applied to geothermal exploration or development. For the permit to be granted, the commission must find that:

- "(1) The granting of the proposed use shall be consistent with the general purpose of the zoning district, the intent and purpose of this chapter, and the general plan;
- (2) The granting of the proposed use shall not be materially detrimental to the public welfare nor cause substantial, adverse impact to the community's character, to surrounding properties; and
- (3) The granting of the proposed use shall not unreasonably burden public agencies to provide roads and streets, sewer, water, drainage, schools, police and fire protection and other related infrastructure."

RECOMMENDATION

The County Council should ensure that the County has an opportunity to review proposed geothermal exploration and development on the island. Any approval process would include a public hearing and assesses if a proposed project is "materially detrimental to the public welfare" (as is required for a special use permit).

Section 25-2-61 of the County Code pertaining to use permits may be modified to include geothermal exploration and development in all districts. The process can be further refined in the rules of the Planning Commissions. The existing (but no longer used) geothermal resource permit procedures could be adapted to this use.

The evaluation of the health impact of a proposal should make use of a formal Health Impact Assessment process. Integrating the HIA with the EIS may be the best approach, however the County cannot require it since it does not have jurisdiction over the state EIS process. Alternatively, the County can require an HIA for its own approval procedure for geothermal power plants, which the developer may choose to integrate with the EIS.

It may be necessary to have a separate application process for geothermal exploration and geothermal development. Presumably, the exploration process would be less burdensome while still providing for the long-term safety of the drill site.

A strict review timeframe is necessary to keep the County accountable and make the process predictable and manageable.

Impact & Benefits

Without the recommended changes, geothermal exploration and development may not be subject to any County land use review other than routine plan approval by the Planning Department. Given the sensitivity towards geothermal energy within the community, it would be prudent for the County to review applications. There are however other approvals from state agencies, such as air pollution permits and environmental impact statements, that may ultimately address these concerns. Having a clear timeline will also increase procedural certainty for the developer, which may reduce overall costs.

Measuring success

The recommended action will be successful if the County Council adopts a project review process that adequately reflects the best interest of island residents.

Key Indicators
▪ Geothermal projects reviewed by County ▪ Project approval rate

Authority

The County's procedure for use permits requires Commission review of a number of listed development types that are not specifically mentioned in state law. Chapter 25, Division 6 of the County Code does not refer to the state law for special permits (HRS §205-6). It seems that the County could add geothermal to the list of development types that require special review, and then develop rules under the Planning Commission for permit approval. An analog to this occurs in land classified as "open" under the County's Zoning Code. While HRS §205-4.5 makes wind energy facilities a permissible use on agricultural lands, the County Code (25-2-61) says any wind energy facility on "open" land in an agricultural district must go through the use permit process.

TIMELINE

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Institute a county-level approval process for geothermal exploration and development that ensures a project is not materially detrimental to the public welfare and includes a public hearing.	$0		EP,PlanCom					
Ordinance drafting	$0		SC,EC					
Make recommendation to Council	$0		EPM					
Planning Commission rule drafting	$0		PlanCom					

Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Community groups ▪ Planning Department ▪ Planning Commissions
Resources Needed	▪ Energy program manager
Funding Sources	▪ No additional funding necessary
Responsible Groups	▪ Energy program staff ▪ Planning Commission ▪ Planning Department ▪ County Council

Risk Assessment	
Technical Feasibility	The existing county geothermal resource permit and use permit procedures can be easily adapted to this policy since they will no longer be used in the process eliminated by Act 97 in 2012.
Political Feasibility	The policy would directly counter the efforts of the Legislature to reduce the approval process for geothermal projects. There is also support for enabling faster geothermal development at the county level. However, representing the interests of island residents is also a key responsibility of the County.
Community Support	There have been at least two long running health-related concerns about geothermal development from the community: (1) Long-term exposure to any released chemicals; and (2) Appropriate emergency response to a catastrophic failure of safety systems. The new state laws do not explicitly address these concerns, so the County may need to do so.

Expand the definition of the Geothermal Asset Fund and the Geothermal Relocation and Community Benefits Fund to address any future geothermal development.

Background

In 1995, the County Council established the Geothermal Asset Fund as part of the County Code "for the purpose of compensating persons impacted by geothermal energy development activities" (Ordinance 95-74). Payments from Puna Geothermal Venture, which is specifically named in the law, are the only revenues for the fund. The obligation to make the payments does not come from the County Code, but rather the plant's geothermal resource permit. Puna Geothermal Venture pays $50,000 into the fund each year. The FY2010-2011 year-end balance was $2,106,800.

Claims against the fund may be made "by any person or organization who is adversely impacted under the activity of geothermal development." The definition of "adverse impact" is for anything that can be substantiated by evidence. No claims have been made against the fund in recent years. The fund was originally administered by the Planning Commission. After the Commission was separated into the Windward and Leeward Planning Commissions, the Windward Planning Commission assumed responsibility in 2009.

A separate Geothermal Relocation Fund was created by the Council in 1996 (Ord. 96-2). The fund was subsequently expanded in 2008 to the Geothermal Relocation and Community Benefits Fund (Ordinance 08-37). The fund can be used for two primary purposes: 1) to purchase property from owner-occupants near the PGV plant; and 2) for infrastructure and service improvements in Lower Puna. The Planning Department administers the fund. According to the department's rules, to qualify for a fund disbursement an applicant must reside within one mile of the plant and have purchased or been building their residence as of October 3, 1989. The rules (Section 10-4(b)) also suggest that there was a single 60 day window for owner-occupants to request relocation.

Unlike the Geothermal Asset Fund, this fund does not collect payments directly from PGV, but instead some or all of the geothermal royalties mandated by HRS

§182-18 (in FY2011, all $568,192.60 went to this fund). The law is not specific to a particular facility but the "utilization of geothermal resources." As of June 30, 2011 the fund contained $3,277,820.

RECOMMENDATION

The County Council should amend the articles of the County Code pertaining to the Geothermal Asset Fund and the Geothermal Relocation and Community Benefits Fund to be applicable to all permanent geothermal resources developments. The requirement for new facilities to contribute to may need to be be created in the permits issued by the County.

For the Geothermal Asset Fund, the Planning Commissions' Rules of Practice and Procedure should also be amended to be applicable to any geothermal development. The split jurisdiction of the Leeward and Windward commissions should be retained.

For the Geothermal Relocation and Community Benefits Fund, both the County Code and the Planning Department's rules will need to be modified. The current rules would require a public hearing to complete the process. The existing conditions of eligibility may be used. The rules should make clear that the fund is available indefinitely to those who qualify.

For both funds, the revenue obtained from individual permitees should only be applicable to claims specifically referencing those permittees and not be pooled together (i.e. one geothermal plant owner should not be paying for another's impacts).

As an alternative to the changes proposed above, the Council may opt to create separate special funds for every new development as they are being permitted.

IMPACT & BENEFITS

The Geothermal Asset Fund wasn't created until about six years after PGV was first issued its permit in 1989 with the Relocation Fund following a year later. Rather than wait for the community surrounding a new geothermal development to request compensation, the County can proactively provide for its needs.

MEASURING SUCCESS

Complete or partial adoption of the recommended actions as part of the County Code and relevant department rules.

Key Indicators

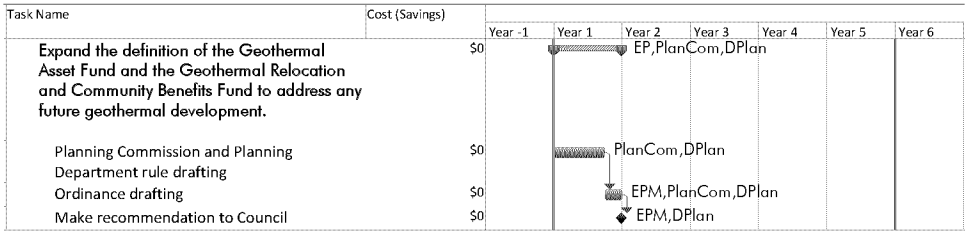
- Fund contributions
- Fund disbursements

AUTHORITY

One effect of Act 97 is that the existing geothermal resource permit process will no longer be applied to new developments. The County has added specific types of development to the list for a Special Use Permit in the past and could do the same for geothermal projects. The Specail Use Permit process does not currently have rules and procedures specific to a particular type of development. Other permits are of course required, but these are a matter of procedure since geothermal development is permitted in all State Land Use Classifications.

It is important to note that the County Code itself does not require PGV to make payments to the Geotheraml Relocation and Community Benefits Fund, it only specifies the payments as the source of funding. The payments are a condition of the geothermal resource permit issued in 1989. This is significant because the County cannot create new taxes or punititve fees through legislation. Any new permit would need to have a similar requirement.

TIMELINE



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Community groups ▪ Planning Department ▪ Planning Commissions
Resources Needed	▪ Energy program manager
Funding Sources	▪ Special funds (revenue)
Responsible Groups	▪ Energy program staff

Risk Assessment	
Technical Feasibility	With the existing approval procedures within the County, there can be minimal new drafting. The language to keep the funds from individual projects separate will require more careful wording.

Political Feasibility	Geothermal is likely to be a hotly debated topic for some time. This policy could demonstrate that the County leaders are planning with the best interest of the community in mind.
Community Support	Providing some basic protections for residents may make new geothermal development more acceptable. This policy may not address all community concerns.

Release a master request for proposals for renewable electricity generation for all County facilities.

Background

The County already has considerable experience in renewable electricity generation. The Department of Water Supply operates several in-line hydroelectric power units throughout the island that convert flowing water into electricity that is used on-site in pumping operations. In 2011, the County installed a 250 kW solar photovoltaic system at the West Hawai'i Civic Center, which is estimated to save $50,000 a year in energy costs. The County of Hawai'i can build on these successes by releasing a Master Request for Proposals (RFP) for renewable electricity generation for all public facilities, including those managed by the Departments of Public Works, Environmental Management, and Parks and Recreation.

The County is not currently permitted to generate electricity and sell the energy to its citizens, nor is it allowed to generate electricity in one location and consume it at another. However, the County can generate electricity and consume it on-site.

Recommendation

The County of Hawai'i should develop and release a Master RFP for renewable electricity generation for all public facilities, including those managed by the Departments of Public Works, Water Supply, and Environmental Management. Respondents to the RFP should be required to evaluate the electricity generation potential for all public facilities and incorporate a portfolio approach to achieving energy savings.

The County should be diligent in evaluating proposed financing mechanisms to ensure the County receives the highest value for these projects.

Impact & Benefits

Each County facility will have a different level of achievable electricity generation at a specific estimated cost. By combining all facilities together in a portfolio approach, the County can maximize renewable energy production given the current regulatory limitations.

Overall savings are unknown at this time; however, a qualified energy contractor can make detailed evaluations of each building to determine achievable generation. An estimate in the County Green Government Action Plan indicates 10% of County facilities could accommodate 1,000 kW of solar PV (4 times the size of the facility at WHCC) and save the County $320,000 per year in energy costs. These savings could be obtained at no up-front cost to the County by using innovative financing mechanisms such as Power Purchase Agreements.

MEASURING SUCCESS

The first major task would be creating a request for proposals that adequately describes the County's needs. The Department of Research and Development has experience with this process. Similarly, structuring the contract itself must be done carefully.

Longer-term success can be easily demonstrated by comparing the current cost of electricity from the grid with the actual energy expenditures of the County.

Key Indicators

- Release of the Master RFP
- Selection of a qualified ESCO
- Annual energy savings (kWh)
- Annual cost savings ($)

AUTHORITY

The Department of Public Works is responsible for operating and maintaining most County facilities.

The Department of Water Supply is responsible for its own facilities as a semi-autonomous agency.

The Department of Environmental Management operates and maintains the County's solid-waste and wastewater treatment facilities.

The Department of Parks and Recreation is responsible for many park-related facilities like community centers and swimming pools.

TIMELINE

Note: Costs are not included in the timeline to avoid double counting with the Revolving Energy Fund. They are accounted for in the overall five-year cash flow included in the Five Year Roadmap.

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Release a master request for proposals for renewable energy projects for all public facilities	$0				EP,DPW-B			
Develop RFP	$0		EPM,EC					
RFP response period	$0			EPM				
Proposal evaluation	$0				EPM,EC			
Install generation equipment	$0					EC		

Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Department of Public Works ▪ State Procurement Office ▪ Department of Accounting and General Services ▪ DBEDT ▪ National Association of Counties ▪ US Department of Energy Office of Energy Efficiency and Renewable Energy ▪ US Environmental Protection Agency
Resources Needed	▪ Energy program manager ▪ Energy Coordinator ▪ Training for DPW buildings employee ▪ Equipment installer/owner
Funding Sources	▪ Revolving energy fund (savings) ▪ Vendor-funded, but could come from the $4M CIP energy fund.
Responsible Groups	▪ The energy program manager should be the project lead, with support and guidance from the Departments of Public Works, Water Supply, Environmental Management, and Parks and Recreation.

Risk Assessment	
Technical Feasibility	Individual facilities may have technical barriers to installing renewable energy generators. In addition, the island's electric utility may attempt to block interconnection of some or all projects on reliability grounds.
Political Feasibility	The County's buildings and other facilities are managed by several different departments, so coordination and cooperation among these decision-makers will be essential to achieving success.
Community Support	The community will likely support efforts to increase renewable energy for public facilities and will also likely support improvements that do not require expenditures of taxpayer funds.

Energy Efficiency

Adopt and maintain strong building energy codes

Background

The County took a significant step in 2009 when it adopted a version of the International Energy Conservation Code (2006) for the first time.[118] However, since then, two new versions of the IECC have been released and have not been adopted by either the State or the County. While the state Building Code Council does have the primary responsibility for adapting new versions of the IECC to Hawai'i, there do not appear to be any restrictions on individual counties acting independently.

The US Department of Energy recognizes that the IECCs are not specifically designed for tropical environments, but nevertheless considers the newer versions of the IECC an improvement upon the past.[119] The Hawai'i-specific amendments to the 2006 IECC can easily be carried over to newer versions. In some cases the new model codes improve on the existing County code, such as with new duct leakage testing and lighting requirements. In others, the County code includes requirements that go beyond the model codes and should be retained, such as for pool equipment efficiency.

There are number of emerging and established building techniques and technologies that could reduce building energy consumption in Hawai'i but are not addressed in either the model codes or the State/County code. The existing code includes suggestions for roof overhangs, window shading and cool roofs, but does not specifically require them. The current codes do not include reference to potential strategies for passive cooling through building siting and natural ventilation. Natural ventilation uses building openings and prevailing winds to reduce or eliminate the need for mechanical cooling. Detailed state-sponsored Hawai'i-specific design guides have been available for at least two decades and have been shown to reduce indoor temperature without consuming energy. More recently, the Hawaii BuiltGreen Guide from 2006[120] has some guidance on building spacing, building orientation, shading, natural ventilation, window and door design, and reducing absorbed solar heat gain.

The current County energy code seems to recognize the possibility of natural ventilation implicitly, by retaining the IECC exemption for "unconditioned buildings" from building thermal envelope requirements (but not systems requirements). The state Building Code Council had opted to remove this exemption from its version of the 2006 IECC, but it was reinstated when adopted by the County of Hawai'i. The zoning chapter of the County Code additionally requires that for plan approval "adequate light and air, and proper siting and arrangements are provided for all structures and improvements" (25-2-77(1) and 25-6-67(1)). Finally, the Planning Departments's Rule 17 covers landscaping requirements for each zoning type. For parking lots specifically the purpose of landscaping is for "moderating the visual impact and microclimate".

Hawaii Energy (SAIC) currently offers a $2,000 incentive (limit 10) to home builders incorporating designs to take advantage of tradewind cooling. A $75 rebate is also available to homeowners for whole-house fans. NREL estimates that whole-house fans can reduce energy demand during hours of use by 75-95% when compared to centralized air conditioning.[121]

Although not included in the building code, starting in January 2010, the state legislature (HRS §196-6.5) requires all new single-family residential construction to include a solar water heater, except if 1) there is an insufficient solar resource; 2) installation is cost prohibitive; 3) a different renewable energy source will used; or 4) an on-demand water heater will be used. As of March 21, 2012, there were a total of 989 variance requests in the state, two-thirds of which were in Hawai'i County. All but two requests had been approved and all but nine were for the instantaneous gas exemption. The variances granted were equal to about 50% of new single-family construction authorizations in 2012 and 2011.

RECOMMENDATION

The energy program staff should lead the regular adaptation of the International Energy Conservation Code in collaboration with the Department of Public Works and the Planning Department. The energy program staff should track the development of new model codes by the International Code Council and adapt them to Hawai'i as they become available, starting with the 2012 IECC if they will result in increased energy savings. Adoption should be within one year of publication by the International Code Council.

- Retain the most stringent requirements from the model IECC for Climate Zone 1.
- Increase the minimum acceptable roof insulation from R-19 (IECC requires R-30). The existing compliance alternatives may be maintained.

- Retain the current County air-leakage exemption for non-conditioned buildings, but introduce more stringent requirements for natural ventilation based on estimated air-changes per hour. Allow whole-house fans under the definition of unconditioned or low-energy buildings if they conform to the energy performance requirements.
- Prevent new construction classified as "unconditioned" from later installing conditioning equipment (e.g. window air conditioners) without also complying with the Energy Code. This can be added to the list of what is checked during routine building inspections (about 10,000 annually). Fines for noncompliance are currently used for other code violations.
- Require all residential structures to be sited to allow for maximum natural ventilation. This may also be expanded to the County subdivision code (Ch. 23, Article 3 "Design Standards") to include lot density and orientation and building placement. Make existing design guides available for review.
- Retain the current County pool equipment efficiency requirements.
- Improve the commissioning requirements for commercial buildings, as described separately below.
- Consider ending the exemption for instantaneous gas water heaters from the state solar water heater requirement for new single family homes.

The County Council should request an annual report from the energy program staff on model energy code development and County efforts. The first year report should include an assessment and implementation plan for the International Green Construction Code. As part of this process, the energy program staff and DPW staff should take advantage of the training programs offered by the International Code Council which can be customized and combined.

Like the current certificate required for energy code compliance, a few pieces of data and a efficiency measure checklist can be included in the necessary permitting to aid in data collection and tracking.

Impact & Benefits

The intent of this priority action is less about creating specific changes to the existing code than ongoing diligence in the analysis, adaptation and adoption of improved energy codes. The U.S. DOE reports that the 2009 IECC has a 14% improvement in energy savings over the 2006 version, and the 2012 version has further improvements.[98,99] The Building Codes Assistance Project estimates that

the 2009 IECC and the ASHRAE 90.1 standard could save tover $30 million a year in energy costs statwide.[122]

MEASURING SUCCESS

Having the County Council adopt a version of the 2012 International Energy Conservation Code will be a major milestone. Subsequent code adoptions, especially ahead of the state schedule, will also indicate progress.

Key Indicators

- New construction
- Unconditioned buildings approved
- Energy savings features used

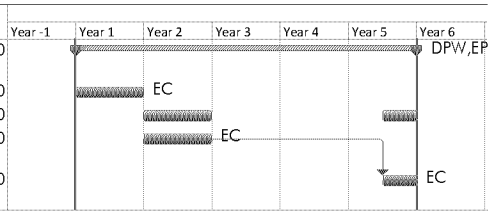
Directly measuring the energy savings due to code adoption will be extremely difficult, though there may be an opportunity to collaborate with the Public Benefits Fee Administrator (currently Hawaii Energy - SAIC) to obtain consumption data and analysis. Data collected through permits can add to ability to track the progress of building efficiency.

AUTHORITY

State law (HRS §107-28) grants the counties the authority to amend the state building code. It does not specifically exclude or allow the adoption of a newer model code than the one adopted by state Building Code Council. Importantly, this section states "Each county shall use the model codes and standards listed in section 107-25, as the referenced model building codes and standards for its respective county building code ordinance." This would seem to allow the counties to amend and adopt any model code regardless of action or approval by the Building Code Council.

TIMELINE

Task Name	Cost (Savings)
Adopt and maintain strong building energy codes	$8,000
Draft code ordinance preparation	$0
Review and adapt new codes	$8,000
Review and adapt new codes (including training) 1	$4,000
Review and adapt new codes (including training) 2	$4,000



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Private contractors and developers ▪ International Code Council ▪ American Council for an Energy-Efficient Economy ▪ US Department of Energy ▪ Department of Public Works
Resources Needed	▪ Ongoing training for County staff from code experts. ▪ Funding
Funding Sources	▪ Revolving energy fund ▪ General fund
Responsible Groups	▪ Department of Public Works ▪ Energy program staff ▪ County Council ▪ Planning Department

Risk Assessment	
Technical Feasibility	Most of the technical analysis for the IECC is completed by the International Code Council and the US Department of Energy. Existing code amendments in Hawai'i can be continued with the new model code. The technical details of any new requirements will require further specification.
Political Feasibility	Despite the documented energy and cost savings, there might be hesitation to enact more stringent requirements that appear to increase construction costs. This may be particularly true with the currently low rate of new development affecting the building industry.
Community Support	Few new houses are being built, so individual residents may be less concerned with the requirements than the building industry. However, the same concerns about a perceived increase in cost could exist. Life cycle costing could improve resident acceptance.

CREATE A BUILDING ENERGY PERFORMANCE RATING AND DISCLOSURE PROGRAM

BACKGROUND

A building energy rating is a simple representation, such as a number score or letter grade, of the energy performance of a building. A rating system can be "asset-based" or "operation-based" or both. Asset-based rating systems use the fixed features of a building, such as insulation, to calculate energy performance and thus a rating. An operation-based rating system relies on data about the energy actually consumed by the building in the form of utility bills or other records. Because they do not depend on the behavior of occupants, asset-based ratings have a specific advantage when used to compare buildings.

The rating itself typically references a benchmarking system to calculate the building score. The benchmarking system may be a fixed scale or a rank scale based on the building's performance relative to other buildings. The rating is typically based on energy consumption but translated to a more user-friendly form such as a number score, star rating, or letter grade.

There are a number of existing rating systems in the United States for both residential and commercial buildings. The Energy Star Portfolio Manager is a tool developed by the EPA to allow buildings to apply for an Energy Star certification. It can also be used to obtain an energy rating on a 100-point scale, though only a score of 75 or better allows a building to carry the Energy Star label.[123] The newer Building Energy Quotient system from ASHRAE is both asset-based and operation-based, whereas the Portfolio Manager is only operation-based.

The most widely recognized residential rating system is the RESNET Home Energy Rating System (HERS). It uses a 150-point scale where a lower score is better, with 100 representing a standard new home. The DOE EnergySmart Home Scale system is based on RESNET to be used in the voluntary Builders Challenge and Energy Star Homes recognition programs. The data for the score comes from an energy assessment conducted by a RESNET certified energy auditor or rater. Like a conventional energy audit, the result of a HERS rating includes a cost analysis of recommended improvements.

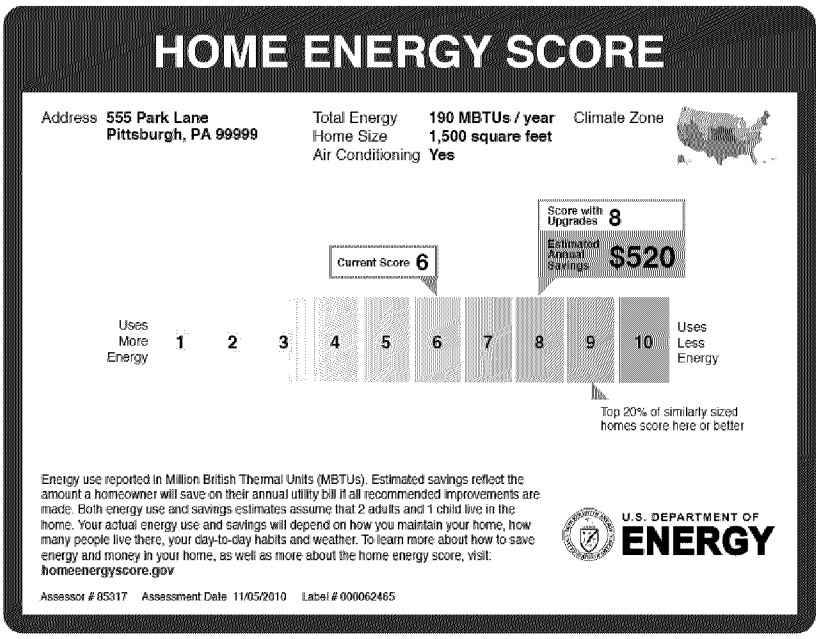


FIGURE 53. AN EXAMPLE HOME ENERGY SCORE LABEL

The DOE and the EPA recently joined together to develop the new Home Energy Score. The HES uses an asset-based approach on a fixed ten-point scale. The rating process is meant to be faster and less expensive than a conventional energy audit but still include recommended improvements with cost estimates. Private energy assessors collect the data and provide the rating, but must be certified by RESNET or the Building Performance Institute. The goal of the HES is to provide states and municipalities with a common and easy-to-use system when developing local policies. The DOE is running an active partnership program with utilities and local governments that is currently accepting requests for participation.

Many rating polices in the US are voluntary, but mandatory disclosure policies are beginning to appear. A disclosure policy may affect only buildings that are being made available for sale or rent, or can reach farther and require all buildings of a given type to participate. The underlying assumption of a mandatory building energy rating disclosure policy is that given a choice, a buyer or renter would prefer a more efficient building. This is the same logic underlying the miles-per-gallon rating for vehicles. It has been shown that the demand for more efficient vehicles increases with fuel prices. Consumers currently do not have enough information to make similar decisions with respect to buildings.

Australia and Denmark were the first countries to adopt mandatory rating policies in 1999 and 1997 respectively.[124] In 2002, the European Parliament enacted a law requiring all member nations to create a national building energy certification and disclosure program for use in new construction, sales, and rentals.[125] A number of jurisdictions in the United States have implemented mandatory

commercial rating policies, and several residential policies are under development.[126]

Of the states and municipalities that have implemented rating and disclosure policies, most are for commercial buildings. Commercial rating policies almost exclusively use the well-established Energy Star Portfolio Manager software. In most cases, the building performance must be disclosed to the government and transaction partners (e.g. buyers, lessees). This may be accomplished through a public website rather than direct communication. Because the building performance process can be complex for commercial buildings all policies have a floor-area threshold, typically 10,000 to 50,000 square feet, though California uses 5,000 square feet. In come cases, multi-family buildings are included in the policy. The Portfolio Manager can also track and report kWh consumption and energy costs, so separate utility bill disclosure may not be necessary.

To date, there are no mandatory residential rating programs in the United States, though a goal of the Home Energy Score program is to make these policies viable for implementation. Existing disclosure policies may only require that utility information or an energy audit be shared, rather than prescribing a specific rating system. Oregon has developed a state-specific home energy rating system, but it remains voluntary.

The Institute for Market Transformation and BuildingRating.org track the progress of disclosure policies nationwide, including:

- Santa Fe, New Mexico requires new homes to obtain a RESNET HERS rating and display the result to prospective buyers. The city's mandatory Residential Green Building Code requires certain HERS scores to be achieved, depending on the conditioned floor space;
- Nevada requires a seller to complete an energy consumption data disclosure form but does not require an audit or rating.
- Austin, Texas is less prescriptive and only requires an energy audit from a certified professional, but not necessarily an energy rating; and
- Alaska has developed a proprietary rating system with disclosure required for building sales (IMT 2011).

Under HRS §196-30 state buildings "larger than five thousand square feet or uses more than eight thousand kilowatt-hours of electricity or energy per year" must be evaluated with the Energy Star Portfolio Manager. Several state buildings have received an Energy Star label, meaning they are in the top 25% of similar buildings. Statewide, the Energy Star database lists 28 labeled buildings for 2011, with only one on Hawai'i Island.[127] Hawai'i currently has no mandatory or voluntary building energy rating or disclosure policy for private buildings.

RECOMMENDATION

The energy program staff and the Department of Public Works should implement a mandatory building energy rating and disclosure system for all buildings on the island at the time of construction or sale.

The County Council should create the program by ordinance amending the County Code. The chapters on zoning or building codes could be used.

The Department of Energy's Home Energy Score or RESNET HERS should be the basis of the residential rating system. The Energy Star Portfolio Manager or the ASHRAE Building Energy Quotient should be the basis of the commercial system. In the case of the Home Energy Score, the federal government may be willing to fund this "pilot" deployment through its existing partner program.

Under this policy sellers and owners would supply the County and interested buyers or lessees with both an approved energy rating certificate and a summary of the previous 36 months of kWh consumption and total electricity cost from utility bills or for the complete period of ownership, whichever is shorter (when available). The numerical energy score must be displayed in all advertisements for a property.

Rating certificates for residential and small commercial rental properties should be no more than five years old at the time of listing. Rating certificates for large commercial rental properties should be no more than 18 months old at the time of listing.

The rating program should begin with a short pilot for county buildings to test the available rating systems. The County should also test potential residential rating systems during this time for applicability to Hawai'i. The program should be expanded to medium to large commercial buildings for two years prior to implementing a residential program. Utility data disclosure may be implemented sooner.

The County should issue an RFP for energy assessors to conduct building ratings for the pilot program. The RFP would include an allocation for employee training to promote the development of a local industry. The program should only be expanded once there are assessors established on the island or with enough advance time for training to take place. Providing additional funding support for training, including DPW inspectors, should also be considered. The energy program staff and DPW should provide reports to the Mayor and County Council at the conclusion of each stage of

implementation.

It does not seem feasible for the County to develop an island-specific rating system, however the state could modify existing methodologies to make sure they represent local climate and building practices and energy prices. Because building energy rating is a rapidly developing field, there may be significant changes in existing rating systems and new systems may become available. The energy program staff should regularly reevaluate the use of the generic systems, particularly if the State develops a Hawai'i-specific rating tool.

Impact & Benefits

Building energy performance disclosure is intended to provide information for buyers and tenants that will allow them to more completely compare the cost of occupying a building. This may spur landlords and sellers to invest in energy improvements to achieve a better rating and make their building more attractive to prospective tenants or buyers. Importantly, these improvements would largely be for existing buildings, which the building energy code typically do not address unless the building is undergoing major renovation.

Creating a database of building energy ratings will enable better energy policy making and analysis. High resolution energy data on buildings is sparse nationwide. Since no municipality has yet adopted a similarly comprehensive rating policy, this could be a significant opportunity for Hawai'i Island to gain recognition and influence the development of state policy. This may also mean opportunities for federal funding support.

The private workforce needed to complete energy ratings would count as green jobs and may spur further green economy growth by increasing the interest in energy efficiency upgrades for buildings.

Measuring Success

The first milestone is the selection of a rating system. Next would be successfully passing the rating requirement into law. Once the system is in place and active, the energy program staff and the Department of Public Works can begin analyzing the results. The Home Energy Score program from the US Department of Energy will provide online tools that can be used for analysis. It would be encouraging to see an increase in the average of new ratings over time and eventually for individual buildings. Individual data points from the building assessments can also be tracked for progress.

Key Indicators

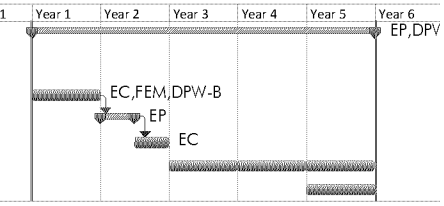
- Buildings rated
- Average rating
- Floor space rated
- Floor space per rating level
- Energy savings recommended
- Energy ratings over time per building
- Individual rating data components

AUTHORITY

The County already requires a number of inspections and certifications for buildings as part of building code compliance. Inspections are typically conducted by County employees. Other building evaluations are conducted by contractors and submitted to the County, such as plans and engineering reviews.

TIMELINE

Task Name	Cost (Savings)
Create a building energy performance rating and disclosure program	$14,500
Rating system selection	$0
Rating pilot with County buildings	$6,000
Rating pilot with large commercial buildings	$0
Commercial building rating program	$6,000
Residential building rating program	$2,500



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Department of Public Works, Building Division ▪ US Department of Energy ▪ Home Energy Score partnership program ▪ Established national rating schemes ▪ Online rating tools ▪ Rating professionals network
Resources Needed	▪ Energy program manager ▪ Training for County staff, DPW ▪ Funding
Funding Sources	▪ Revolving energy fund ▪ General fund ▪ Building permit fees
Responsible Groups	▪ Energy program staff ▪ DPW ▪ Building owners ▪ Energy raters ▪ Real estate agents

Risk Assessment	
Technical Feasibility	It may be challenging for landlords to track the utility information of their tenants. A building rating with an energy estimate may substitute. The disclosure requirement may need to be limited to sales only. The County must also ensure that the rating system is valid for Hawai'i.

Political Feasibility	The apparent complexity of the policy may hinder political support. The potential for green jobs may offset this concern. The program would not be zero cost overall and would increase the workload of County employees.
Community Support	Although the cost of an rating assessment is small compared to typical building sales prices, any increase in costs for home and business owners may meet resistance.

REQUIRE INDEPENDENT COMMISSIONING FOR ALL NEW LARGE COMMERCIAL CONSTRUCTION PROJECTS AND MAJOR RENOVATIONS

BACKGROUND

The County Code (Section 5-2.1.1) amends the International Energy Conservation Code 2006 to introduce a requirement for a commissioning plan for commercial buildings. The Code defines commissioning as a process that "verifies and documents that the selected building systems have been designed, installed, and function according to the owner's project requirements and construction documents." It also outlines the required elements of a commissioning plan (produced before commissioning takes place). The language does not specify who is responsible for commissioning. The law does not require the plan to be submitted to or reviewed by the County.

Commissioning agents provide third-party verification of building systems design and function. For new construction, the process is simply referred to as "commissioning"; for existing buildings, the term "retro-commissioning" may be used. Recommissioning is a follow-up to a previously commissioned building. Finally continuous or ongoing commissioning involves constant monitoring and adjustment of building systems to optimize efficiency and effectiveness.

Best practices for commissioning have developed significantly in recent years. One survey from the University of Cincinnati revealed the following best practices:[128]

- Commissioning should begin with the first conceptual stages of building design
- Commissioning agents should be independent of the other parties (e.g. architect, engineer, construction company)
- Commissioning agents should be certified
- Functional testing should be included

Several organizations have developed certifications for commissioning agents. ASHRAE provides certification of commissioning agents through its Commissioning Process Management Professional Certification. The Building Commissioning Association provides certification through its Certified Commissioning Professional and Associate Certified Commissioning Professional programs. The Associated Air

Balance Council offers certification through the AABC Commissioning Group. The Association of Energy Engineers offers the Certified Building Commissioning Professional program.

Both the Analysis and Recommendations for the Hawaii County Energy Sustainability Plan (2007) report and a report from the Energy Advisory Commission to Mayor Kim 2008 included recommendations pertaining to commissioning.

Hawaii Energy (SAIC) provides a number of incentives and programs to support building systems efficiency, including funding for commissioning in its Central Plant Optimization Competition.

RECOMMENDATION

The County Council should adopt an ordinance creating a requirement for building commissioning in large commercial building construction and major renovation.

Commissioning agents should be certified by an approved organization and operate independently of the owner, architect, construction firm or equipment installer. Commissioning agents must submit a copy of their certification the Department of Public Works before participating in any projects in the County.

A commissioning statement should be submitted along with the building permit (similar to ADA and IECC 2006 certifications), signed by the commissioning agent.

Large commercial buildings are defined as those with a conditioned floor space of 5,000 square feet or greater.

Major renovations are defined in Section 5-6 of the County Code as "when additions, alterations or repairs within any twelve-month period exceeds fifty percent of the replacement value of an existing building or structure..."

IMPACT & BENEFITS

Commissioning helps increase building owners' confidence in their energy investments, realize actual energy and cost savings, and increase occupant satisfaction.

A Lawrence Berkeley National Lab study revealed that commissioning adds an 0.4% (median) to a construction budget for a new building, but resulted in a 13% (median) energy savings for the whole building. For existing buildings, the median savings were found to be 16%.[100] The study found that commissioning can begin

to pay for itself even before any energy savings are realized through reduced equipment costs. Despite these advantages, commissioning is still a developing practice for both new and existing buildings. Because commissioning typically involves more than just energy optimization, such as contninuous monitoring, the benefit-cost ratio can seem too low.

MEASURING SUCCESS

Getting the new requirement passed by the County Council is the most important goal. Using individual commissioning plans submitted to the County to track process may be challenging unless strict reporting requirements and forms are introduced. However, this may inhibit innovation in the private sector. More simply, the number of buildings commissioned and the anticipated energy savings could be tracked. "Retrocommissioning" for existing buildings would be particularly interesting. It would not be possible to obtain actual energy savings data unless it is provided voluntarily by the building owners.

Key Indicators

- Commissioning agents on file
- Commissioning certifications submitted
- Square feet commissioned

AUTHORITY

This requirement is an extension of the existing Section 5-2.1.1 of the County Code. The County has the ability to create these special additions to the model codes.

TIMELINE

Task Name	Cost (Savings)	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Require independent commissioning for all new large commercial construction projects and major renovations	$0		EP,DPW					
Ordinance drafting	$0		EC,EPM					
Submit to Council	$0		◆					

Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Commissioning certification and training organizations ▪ Deparment of Public Works
Resources Needed	▪ Energy program manager
Funding Sources	▪ No additional resources needed

Responsible Groups	▪ County Council ▪ Department of Public Works

Risk Assessment	
Technical Feasibility	No technical commissioning plan review by the County is required. The programs relies on self-submission of commissioning statements and commissioning agent certifications. Entering information from the plans into database may be time consuming
Political Feasibility	There may be some resistance from the building industry to additional requirements in construction permitting. The significant life-cycle cost savings should gain the support of building owners.
Community Support	The direct benefit the broader community will not be readily apparent. Opposition from smaller businesses may arise if they are unfamiliar with commissioning. This can be managed by making adequate information available and setting an appropriate effective date for implementation.

RESTRICT THE SOLAR WATER HEATER TAX CREDIT TO EXISTING BUILDINGS

BACKGROUND

Starting in January 2010, the state legislature requires all new single-family residential construction to include a solar water heater, except if there is an insufficient solar resource, installation is cost prohibitive, a different renewable energy source will used, or an on-demand water heater will be used(HRS §196-6.5). However, Hawai'i County's solar water heater tax credit (Chapter 19, Article 13 of the County Code) does not distinguish between new and existing building. This runs the risk of excessive "free-ridership" with tax credit applicants getting a subsidy for an installation they would have otherwise completed without the credit. The County Code does not specify a cap on the number of credit applications that may be approved each year.

RECOMMENDATION

The County Council should amend Section 19-104 of the County Code to make new single-family residential construction ineligible for the solar water heater tax credit.

IMPACT & BENEFITS

This change would reduce revenues lost to free-ridership for the tax incentive. It is not necessary to subsidize something that is required. With current application rates for the credit (261 in 2010), the County could expect a maximum of $72,000 in savings. New single-family construction in 2011 was 581 homes, or a potential for $174, 300 in lost tax revenue. A total of 301 of those homes applied for exemption from the solar water heater requirement. However, this does not mean that every new home applied for the credit. The actual figure likely includes new and existing homes.

MEASURING SUCCESS

A reduction in the number of applications for the credit would be expected. To make tracking easier, the Department of Finance could require that credit applicants indicate if their home is newly built or existing.

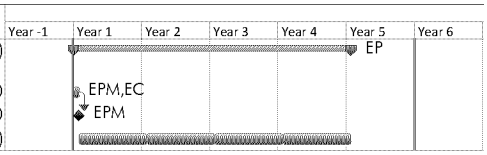
Key Indicators
▪ Number of tax credit applications ▪ Total program revenue (lost)

AUTHORITY

The County Council created the tax credit and has the authority to amend it.

TIMELINE

Task Name	Cost (Savings)
Restrict the solar water heater tax credit to existing buildings	($140,000)
Draft ordinance	$0
Make recommendation to council	$0
Lost revenue reduction (4 years)	($140,000)



Resource Assessment	
Resources Available	▪ Energy Coordinator
Resources Needed	▪ None
Funding Sources	▪ General fund (savings)
Responsible Groups	▪ County Council

Risk Assessment	
Technical Feasibility	There are no technical barriers.
Political Feasibility	A decrease in applications may make the program appear less successful when compared to previous years.
Community Support	There may be some resistance from residents looking to build a home, though construction has slowed considerably. The tax credit is small compared to the cost of construction of a new home.

CREATE A REVOLVING ENERGY FUND TO CAPTURE ENERGY COST SAVINGS FROM COUNTY OPERATIONS FOR REINVESTMENT

BACKGROUND

A Revolving Energy Fund is a pool of capital that is used to finance energy efficiency and renewable energy projects that are expected to generate consistent energy savings into the future. The fund is replenished over time as the energy savings are realized, which allows new projects to financed.

Revolving funds have been widely used across the country for business and economic development, energy efficiency, and community improvement projects.[811] Some revolving funds target only municipal operations, while others are used for both public and private projects.

The County of Hawai'i should establish a Revolving Energy Fund for government facilities and operations. This fund would be financed by savings from existing energy projects (e.g. West Hawai'i Civic Center solar PV installation) and through energy efficiency projects funded by the authorized $4M capital improvement bond. Energy savings and operational cost reductions should be separately tracked, and a portion of those savings should be allocated to the General Fund, and the remainder returned to the Revolving Energy Fund to be allocated to future energy projects. Both energy efficiency and renewable energy projects should qualify for financing from the REF.

RECOMMENDATION

The energy program manager should work with the Department of Finance and the Department of Public Works to establish a Revolving Energy Fund for county operations.

The energy program staff, the Department of Public Works and the Department of Finance should establish project funding guidelines, but the REF should only be used for energy projects that will reduce operational costs through energy savings. This will allow for the REF to be replenished with a portion of the savings, ensuring the REF has the ability to finance new projects into the future.

The fund should be seeded with savings from existing and future energy projects, including savings from the $4M energy efficiency capital improvement

bond currently administered by the Department of Public Works.

Impact & Benefits

Establishing a Revolving Energy Fund leverages savings from existing and future energy projects to continually finance new energy saving opportunities. Each project funded will have different energy savings potentials and expected operation cost savings.

Measuring success

The revolving fund is itself a mechanism for tracking energy cost savings in the County. If deployed properly, the fund balance should only grow over time. The quantity and capacity of investments enabled by the fund should be clearly tracked and reported by the energy program staff.

Key Indicators

- Annual energy savings
- Annual energy expenditure savings
- Annual REF project funding
- REF year-end balance

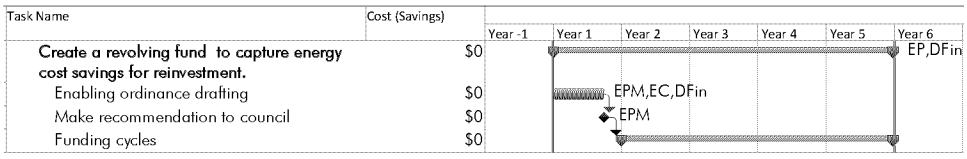
Authority

The Hawai'i County Charter (Section 6.3) describes the powers, duties, and functions of the Department of Finance, which includes the accounting functions for the County.

HRS Section 36-41 requires the County to evaluate public facilities for energy efficiency improvements through performance contracting. It also states that "Agencies that perform energy efficiency retrofitting may continue to receive budget appropriations for energy expenditures at an amount that shall not fall below the pre-retrofitting energy budget but shall rise in proportion to any increase in the agency's overall budget for the duration of the performance contract or project payment term." This allows energy savings to be collected and re-invested in other projects.

Timeline

Note: Costs are not included in the timeline to avoid double counting. They are accounted for in the overall five-year cash flow included in the Five Year Roadmap.



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Department of Finance
Resources Needed	▪ Energy program manager
Funding Sources	▪ Revolving energy fund
Responsible Groups	▪ Energy program staff ▪ Department of Finance

Risk Assessment	
Technical Feasibility	The current acounting system may not be well suited to a revolving fund. All savings are currently retained in the fund for which they were originally budgeted. Moving funds can sometimes require County Council approval. Revolving funds have been implemented elswehere and are technically feasible.
Political Feasibility	Expenditure savings from energy efficiency and renewable energy projects are currently absorbed by the General Fund, which helps to offset the budget reductions of the past several years. There will be some reluctance to set aside those savings for future projects; however, resistance can be reduced by allowing a portion of the savings to return to the General Fund, while the balance of the savings are allocated to the Revolving Energy Fund.
Community Support	The community will likely support efforts to improve the efficiency of public facilities, and will also likely support improvements that do not require new expenditures of taxpayer funds.

Conduct energy service performance contracting for County facilities

Background

Energy Performance Contracts (EPCs) provide guaranteed energy savings through energy efficiency and renewable energy improvements, paid for by the decrease in utility bills over the life of the EPC. Energy Performance Contracts are designed to minimize initial investment through innovative financing (guaranteed energy savings contracts provide cash flow to finance the initial energy efficiency improvement, the engineering and other services of the performance contractor). This arrangement typically allows for energy efficiency investments to be made without any up-front cost to the customer while still providing for lower energy bills over the life of the investment.

State law (HRS §36-41) actually requires the County to pursue EPCs: "All agencies shall evaluate and identify for implementation energy efficiency retrofitting through performance contracting." Importantly, the definition of "agency" used includes "any executive department, independent commission, board, bureau, office, or other establishment of the State or any county government..." It goes further to suggest "Agencies that perform energy efficiency retrofitting may continue to receive budget appropriations for energy expenditures at an amount that shall not fall below the pre-retrofitting energy budget but shall rise in proportion to any increase in the agency's overall budget for the duration of the performance contract or project payment term."

The State is a leader in implementing Energy Performance Contracting: in 2009, total performance contracting investments exceeded $99 million, generating savings of 172.6 GWh in energy use and $271 million in electricity cost.[101] The Lead by Example program from DBEDT uses fiscal year 2005 as a baseline for comparison. Overall, state agencies have reduced energy consumption by 5.1% through 2010 or 8.4% since consumption peaked in 2007. The Department of Accounting and General Services, which manages many state facilities, saw reductions of 13.5% and 18.5%, respectively.

The University of Hawai'i-Hilo and Hawai'i Community College began using EPCs in 1996 that have involved $11M in energy efficiency investments that has saved more than $52M in energy costs through 2010, with savings projected to increase every year for the life of the improvements. In addition, the

improvements have resulting maintenance expense reductions of $200,000 every year. Other projects on Hawai'i Island include retrofits of police, fire, and public safety facilities whose savings are on-going.

The State Department of Business, Economic Development, and Tourism (DBEDT) has published a guide for state agencies and county governments to effectively utilize EPCs to reduce energy consumption and save taxpayer dollars.[83] The latest EPC guide provides and overview of the benefits of EPCs, a description of the financing mechanisms available, a detailed description of the contracting process, and suggestions for managing and coordinating an EPC over the long-term. The Department of Accounting and General Services has developed boilerplate documents specifically for both state and county agencies to use in pursuing performance contracting.[54]

RECOMMENDATION

The County of Hawai'i should develop and release a Master RFP for energy performance contracting for all public facilities, including those managed by the Departments of Public Works, Parks & Recreation, and Environmental Management. Respondents to the RFP should be required to evaluate the energy savings potential for all public facilities and incorporate a portfolio approach to achieving energy savings. The contract should have a "guaranteed savings" structure.

The County should utilize the considerable knowledge and experience of the State of Hawai'i in developing the Master RFP and throughout the EPC selection and contracting process. The State Procurement Office, the State Department of Accounting and General Services, and the State Department of Business, Economic Development, and Tourism have resources available to assist the County with this process.

IMPACT & BENEFITS

Each public facility will have a different level of achievable energy savings at a specific estimated cost which a contractor would identify. By combining all public facilities together in a portfolio approach, the County can use extraordinary savings from some buildings to help boost cost-effectiveness of savings from more modern facilities that might not be cost-effective on their own.

Overall savings are unknown at this time; however, a qualified energy service contractor (ESCO) will make detailed evaluations of each building to determine achievable savings. The final contract with the ESCO will allow the County to

achieve energy savings with no up-front investment and realize immediate and continuous savings in operating expenses going forward.

If the county sees savings similar to the State, a 5.1% reduction in consumption would equal over $400,000 annually while a 13.5% reduction would be over $1 million, assuming the price of electricty remains constant.

MEASURING SUCCESS

The contractor hired would be responsible for guaranteeing the energy savings it promised. The County would want to see that the cost savings were realized and remain steady over time. The revolving fund would also be a place to monitor for progress. In assessing the long-term value of this approach to energy efficiency, the comparison between actual cost savings under the contract to the potential cost of the energy saved (that is the energy saved multiplied by the utility rate) would help the County decide if this model should be continued.

Key Indicators

- Release of the Master RFP
- Selection of a qualified ESCO
- Annual energy savings (kWh)
- Annual cost savings ($)

AUTHORITY

The Department of Public Works is responsible for operating and maintaining most County facilities.

The Department of Water Supply is responsible for its own facilities as a semi-autonomous agency.

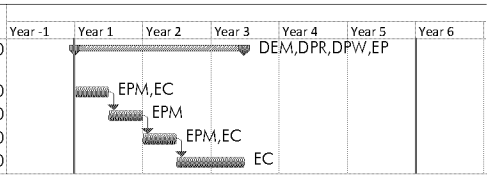
The Department of Environmental Management operates and maintains the County's solid-waste and wastewater treatment facilities.

The Department of Parks and Recreation is responsible for many park-related facilities like community centers and swimming pools.

Hawai'i Revised Statutes Section 36-41 requires the County to evaluate public facilities for energy efficiency improvements through performance contracting. The section allows the County to enter into guaranteed energy savings contracts to finance energy efficiency improvements.

TIMELINE

Task Name	Cost (Savings)
Conduct energy service performance contracting for County facilities	$0
Develop RFP	$0
RFP response period	$0
Proposal evaluation	$0
Install efficiency measures	$0



Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ State Procurement Office ▪ Department of Accounting and General Services boilerplate documents ▪ DBEDT guide ▪ National Association of Counties ▪ US Department of Energy Office of Energy Efficiency and Renewable Energy ▪ US Environmental Protection Agency
Resources Needed	▪ Energy program manager ▪ Buildingds Division staff training ▪ Performance Contractor
Funding Sources	▪ Revolving energy fund (savings)
Responsible Groups	▪ The energy program manager should be the project lead, with support and guidance from the Departments of Public Works, Water Supply, Environmental Management, the Police Department, the Fire Department, and Parks and Recreation.

Risk Assessment	
Technical Feasibility	Individual facilities may have technical barriers to achieving energy savings; however, the portfolio approach suggested here will minimize the impact of technical challenges to implementation.
Political Feasibility	The County's buildings and other facilities are managed by several different departments, so coordination and cooperation among these decision-makers will be essential to achieving success.
Community Support	The community will likely support efforts to improve the efficiency of public facilities, and will also likely support improvements that save taxpayer dollars.

ESTABLISH EFFICIENCY STANDARDS FOR COUNTY EQUIPMENT PURCHASES

BACKGROUND

The federal government, the State of Hawai'i, and many local governments around the country have established energy efficient product purchasing requirements to ensure adequate consideration of energy efficiency for energy consuming products. The County of Hawai'i should adopt its own energy efficiency specifications in order to achieve the substantial energy and cost savings available.

At the federal level, the US Department of Energy has established a Federal Energy Management Program which assists other government agencies "in identifying energy- and water-efficient products that meet federal acquisition requirements, conserve energy, save taxpayer dollars, and reduce environmental impacts."* Federal laws and regulations require purchase of ENERGY STAR or FEMP approved products unless no approved products exist or no approved product is cost effective over the product life-cycle, including energy savings.

The State of Hawai'i requires that government purchasing practices include energy efficiency specifications, including life-cycle costing (HRS Section 103D-410). HRS 196-23 requires state agencies to purchase ENERGY STAR products when life-cycle cost effective.

Guidelines for establishing energy efficiency standards for procurement are available from:

- US Department of Energy, Office of Energy Efficiency and Renewable Energy
  http://www1.eere.energy.gov/femp/technologies/procuring_eeproducts.html
- US Environmental Protection Agency
  https://www.energystar.gov/index.cfm?c=bulk_purchasing.bus_purchasing
- National Association of Counties
  http://www.naco.org/programs/csd/Pages/GreenGovernmentInitiative.aspx
- ICLEI Local Governments for Sustainability
  http://www.icleiusa.org/action-center/tools/energy-efficient-purchasing

* FEMP 2012

RECOMMENDATION

The County of Hawai'i should adopt a policy that establishes energy efficiency requirements for new purchases over $5,000. The policy should also apply to all purchases that are let out to bid, and the policy should specify that the bidders are required to comply with the energy efficiency specifications and provide acceptable documentation at no cost to the County. The policy should be implemented by the Department of Finance, Purchasing Division, but should be considered by other departments with energy-consuming product needs (such as Information Technology, Public Works, etc.) when those departments are specifying purchasing requests to the Department of Finance.

The energy program staff should assist the Department of Finance in developing appropriate purchasing guidelines. There are several approaches to energy efficiency purchasing requirements that have been implemented by other local governments throughout the country. Most policies require purchase of ENERGY STAR rated products (ENERGY STAR is a joint program of the US EPA and the US Department of Energy). Typically, these policies target the following purchasing categories:

- Lighting systems
- Building envelope products (insulation, windows, etc.)
- Space conditioning systems (HVAC)
- Office equipment
- Information technology equipment (computer servers, etc.)

IMPACT & BENEFITS

Energy efficient products (such as Energy Star-rated products) reduce energy consumption by 10-75% and result in operational cost savings of 5-75% percent on a continual basis, depending on the product replaced.

MEASURING SUCCESS

Data from the Energy Star program and Hawaii Energy (SAIC) can be used to estimate the life-cycle cost savings from efficient equipment purchases. The Purchasing Division and other county procurement agents will need to request energy savings specifications in bids to help estimate cost savings.

Key Indicators

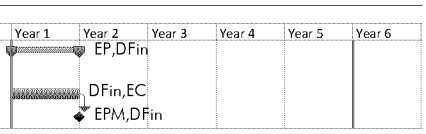
- Number of purchases improved
- Estimated energy savings from new equipment
- Cost difference between efficient and convential purchases

AUTHORITY

The Hawai'i County Charter (Section 6.3) describes the powers, duties, and functions of the Department of Finance, which includes the functions of the purchasing agent for the County.

TIMELINE

Task Name	Cost (Savings)
Establish efficiency standards for County equipment purchases	$0
Draft policy as resolution or ordinance	$0
Make recommendation to Council	$0



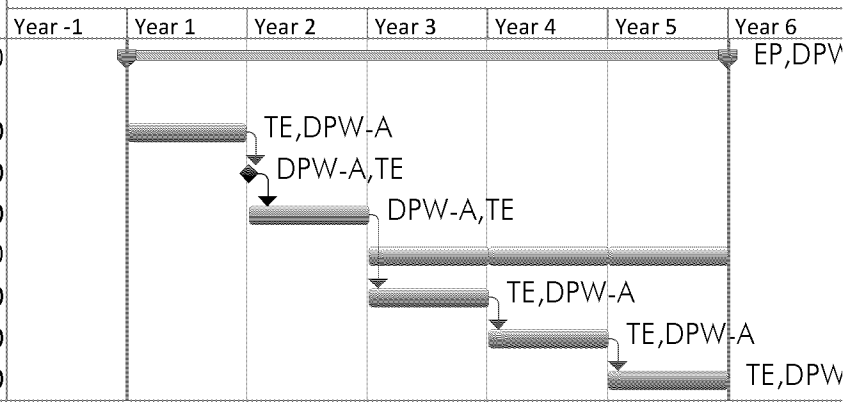
Resource Assessment	
Resources Available	▪ Energy Coordinator ▪ Department of Finance, Purchasing Division ▪ Existing model procurement policies ▪ Federal Energy Management Program ▪ State Procurement Office
Resources Needed	▪ Employee training
Funding Sources	▪ No additional funding necessary
Responsible Groups	▪ Department of Finance, Purchasing Division

Risk Assessment	
Technical Feasibility	A County-wide purchasing policy is already in effect, which specifies authorized staff members and provides purchasing requirements. This policy can be modified to incorporate energy efficiency specifications and life-cycle costing analysis for certain County purchases.
Political Feasibility	There may be some resistance to modifying the current purchasing policy, particularly if the changes are viewed as increasing the initial cost of purchase. Cost-based objections can be mollified by reference to the life-cycle costing provisions, which will demonstrate the true cost implications of inefficient purchasing decisions. An successful energy efficiency purchasing policy will require effective coordination among the various departments of the county government.
Community Support	Energy efficient purchases will make better use of scarce taxpayer funds, improve service and reliability, and reduce the island's dependence on imported energy. This policy will probably be viewed positively by the community.

APPENDIX B: RECOMMENDATION TIMELINES

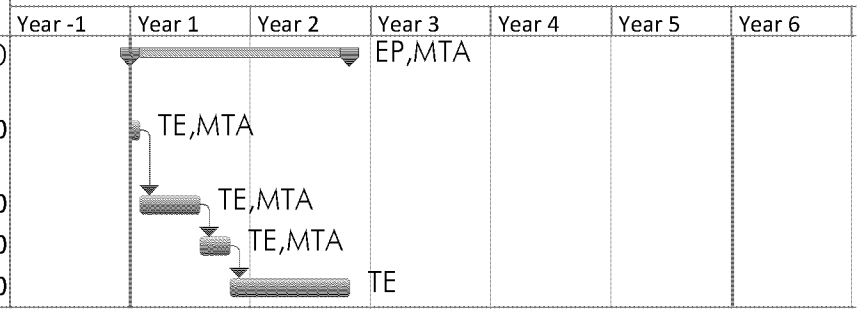
	Short Description	Timeline
		Transportation
1	Coordinate the formation of a large fleet owners consortium.	

Task Name	Cost (Savings)
Coordinate the formation of a large fleet owners consortium.	$16,000
Outreach and planning	$0
Initial meeting	$1,000
Consortium incorporation	$0
County annual management	$15,000
County annual management 1	$5,000
County annual management 2	$5,000
County annual management 3	$5,000



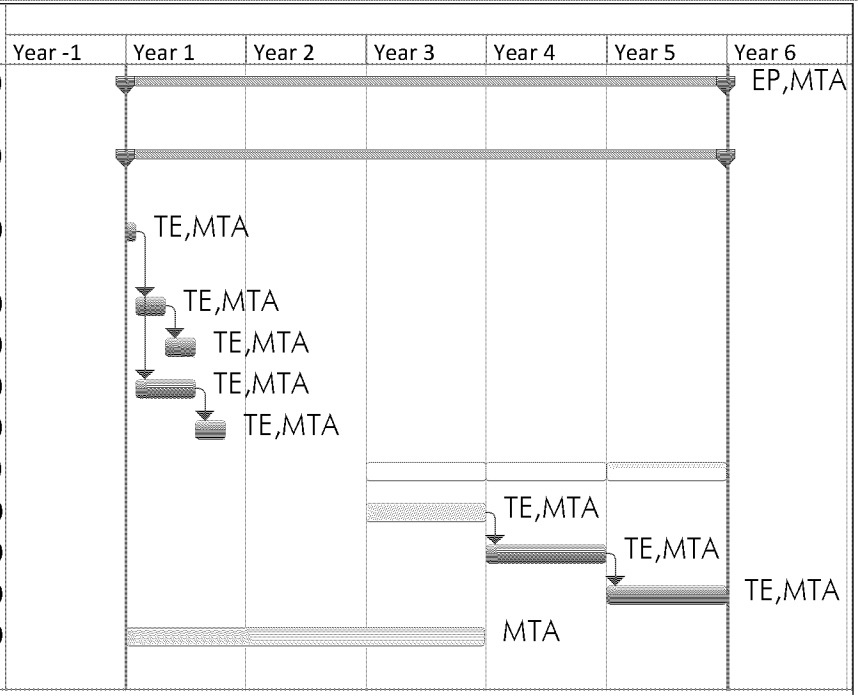
2	Fund a comprehensive mass transit strategic plan to increase ridership and introduce modern transit management	

Task Name	Cost (Savings)
Fund a comprehensive mass transit strategic plan.	$250,000
Draft appropriations request or include in budget	$0
Develop RFP for planning consultant	$0
RFP response period	$0
Plan development with consultant	$250,000



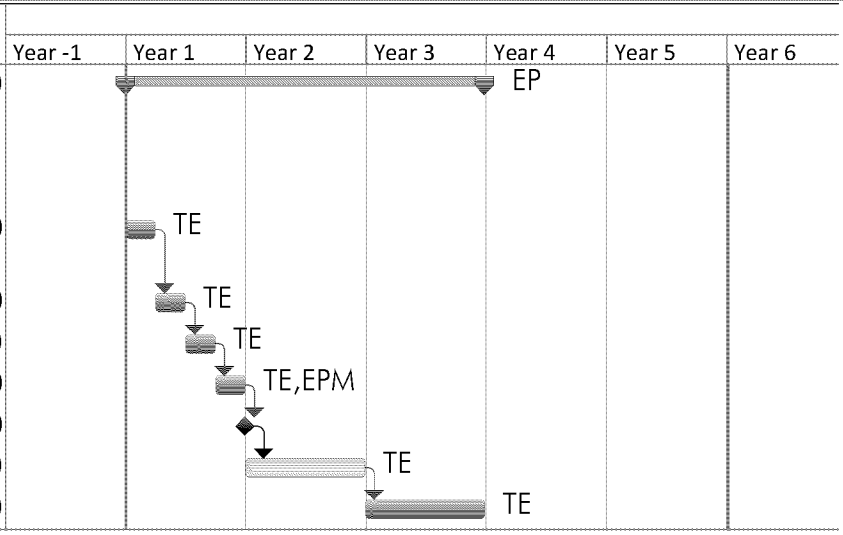
	Short Description	Timeline
3	Increase the user-friendliness of Hele-On bus information for riders.	

Task Name	Cost (Savings)
Increase the user-friendliness of Hele-On bus information for riders.	$30,500
Data system and customer interface	$30,500
Draft appropriations request or include in budget	$0
Draft RFI	$0
RFI response period	$0
Draft RFP	$0
RFP response period	$0
Annual data system maintenance	$10,500
Annual data system maintenance 1	$3,500
Annual data system maintenance 2	$3,500
Annual data system maintenance 3	$3,500
Bus stop signage and display installation complete	$0



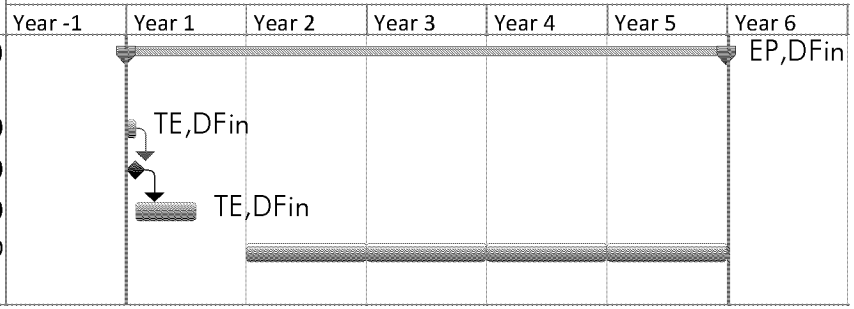
	Short Description	Timeline
4	Provide grant funding to vehicle dealers and repair businesses to acquire and install electric vehicle servicing equipment	

Task Name	Cost (Savings)
Provide grant funding to vehicle dealers and repair businesses to acquire and install electric vehicle servicing equipment.	$120,000
Draft appropriations request or include in budget	$0
Develop funding solicitation	$0
Solicitation period	$40,000
Proposal review	$0
First award decision	$0
Begin second solicitation	$40,000
Begin third solicitation	$40,000



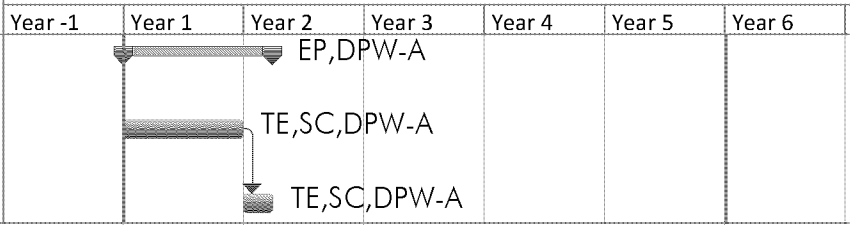
	Short Description	Timeline
5	Create a property tax credit for electric vehicle charging stations.	

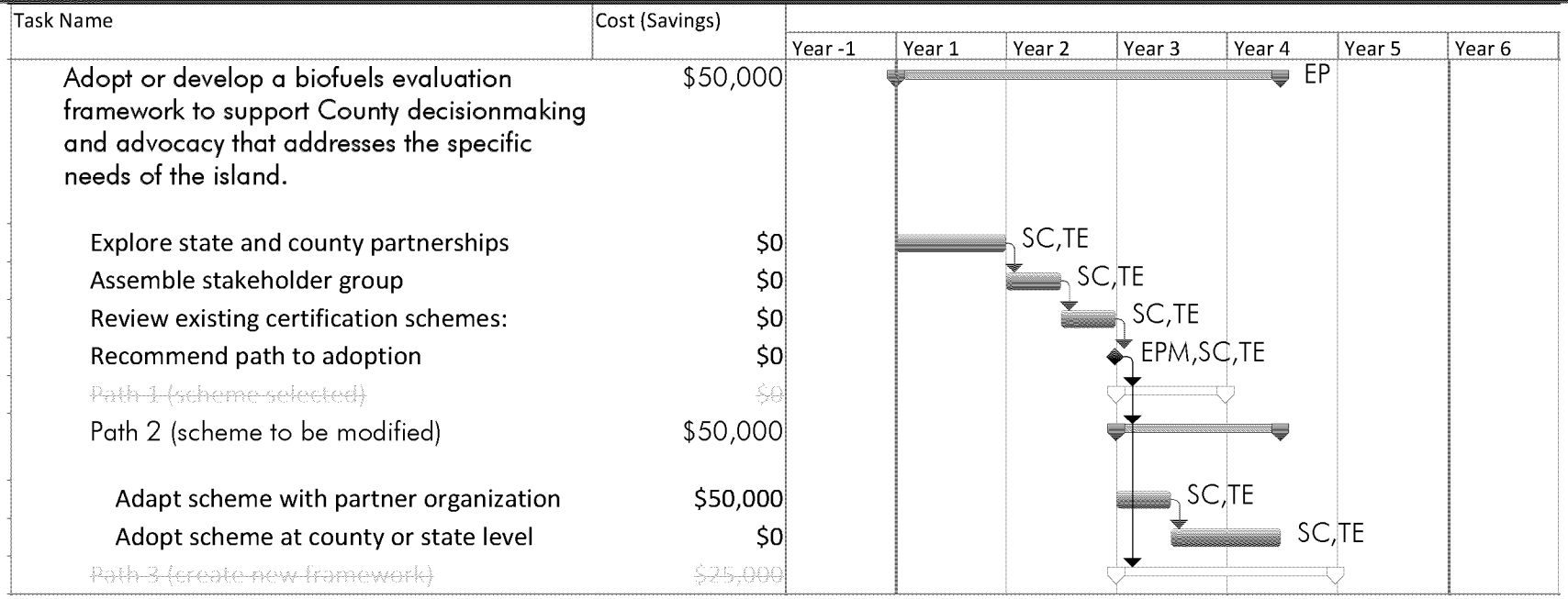
Task Name	Cost (Savings)
Create a property tax credit for electric vehicle charging stations.	$75,000
Draft ordinance	$0
Make recommendation to Council	$0
Forms and application process development	$0
Annual revenue reduction	$75,000

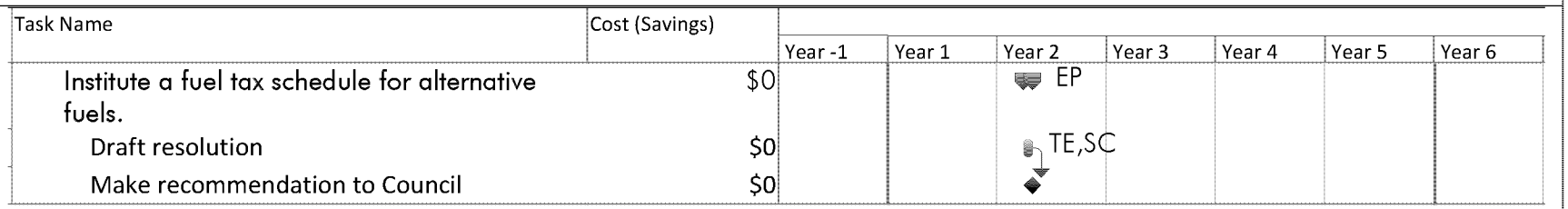


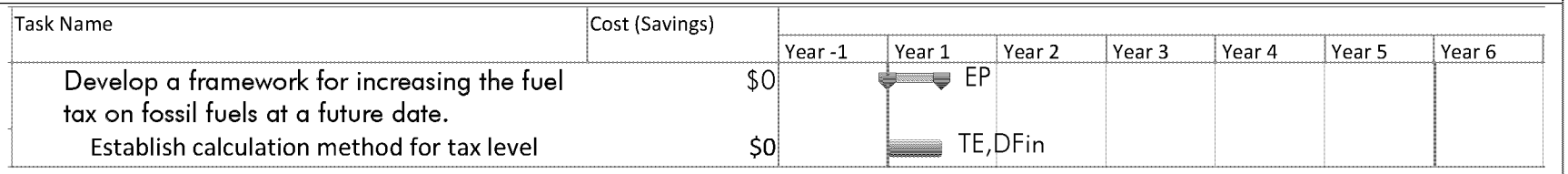
	Short Description	Timeline
6	Establish a county-wide priority policy for alternative fuels.	

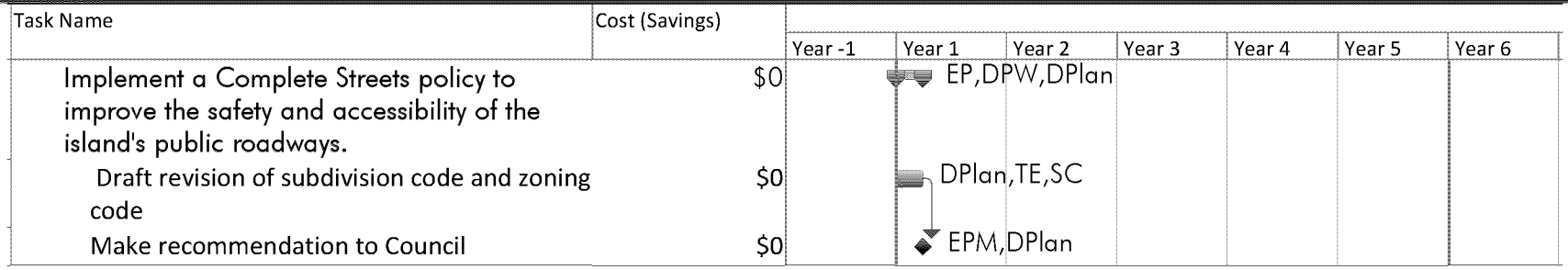
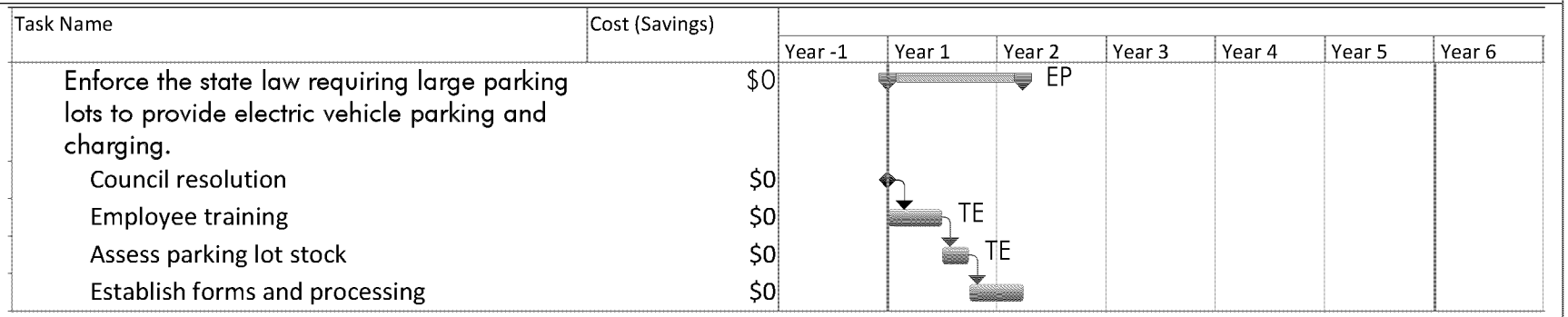
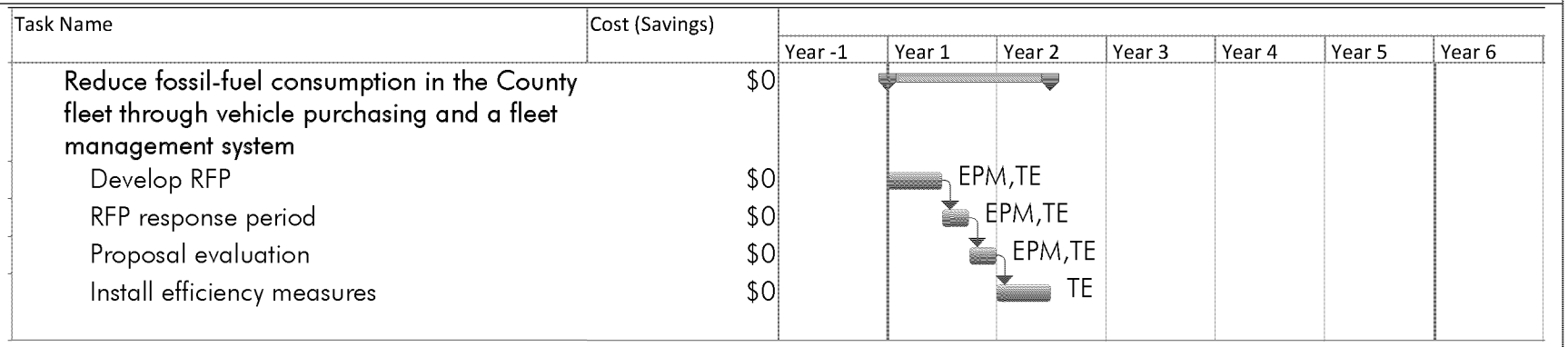
Task Name	Cost (Savings)
Establish a county-wide priority policy for alternative fuels.	$0
Develop reporting guidelines and documentation	$0
Draft resolution	$0

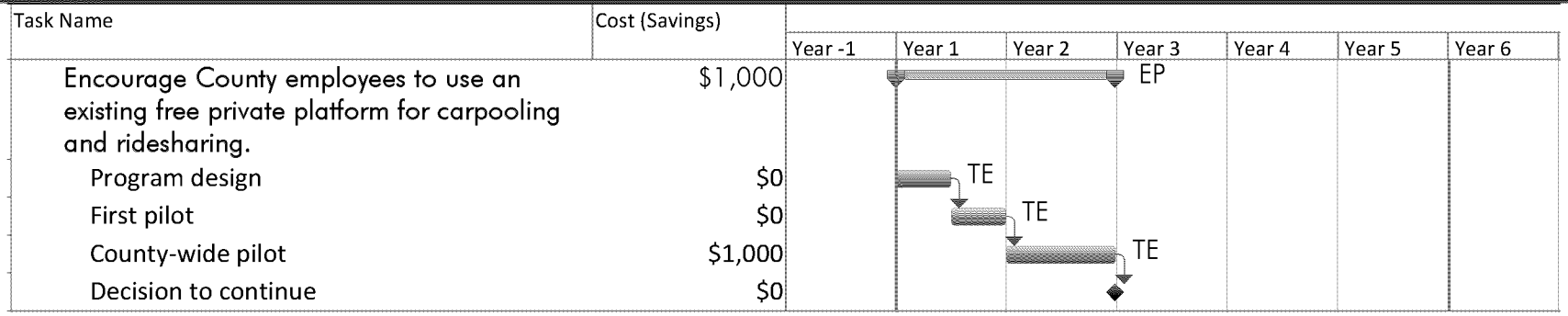


	Short Description	Timeline
7	Adopt or develop a biofuels evaluation framework to support County decision-making and advocacy that addresses	

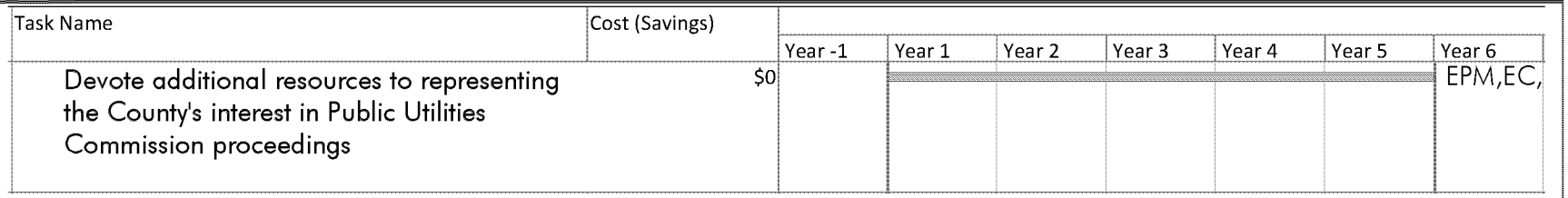
8	Institute a fuel tax schedule for alternative fuels.	

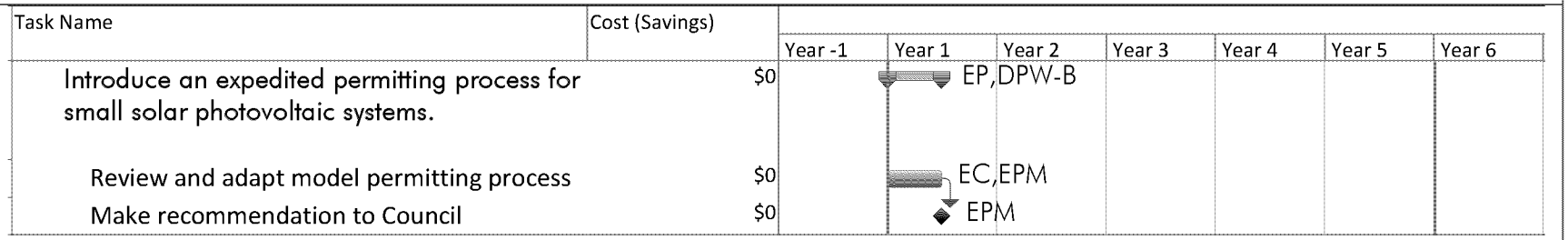
9	Develop a framework for increasing the fuel tax on fossil fuels at a future date.	

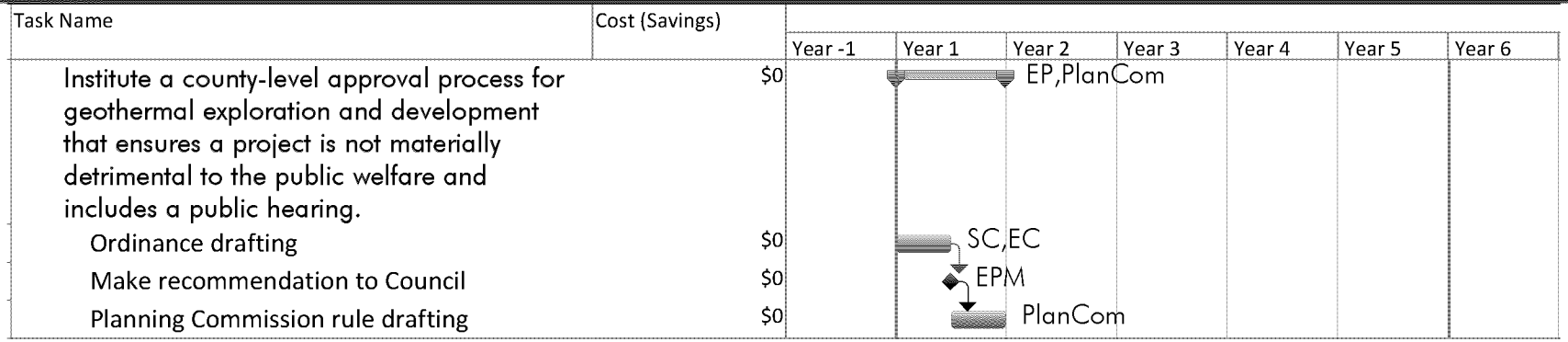
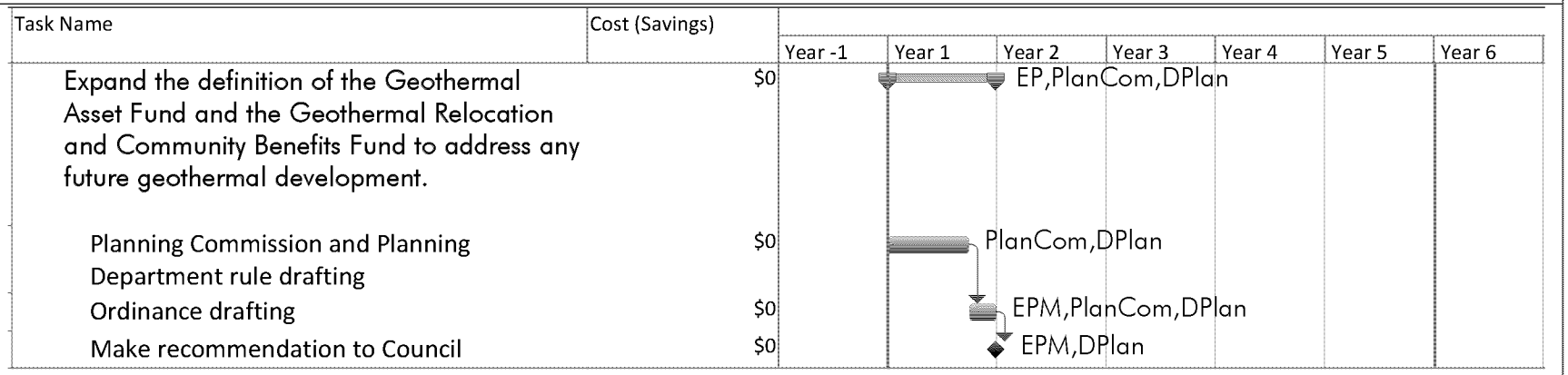
	Short Description	Timeline
10	Implement a Complete Streets policy to improve the safety and accessibility of the island's public roadways.	
11	Enforce the state law requiring large parking lots to provide electric vehicle parking and charging.	
12	Reduce fossil-fuel consumption in the County fleet through vehicle purchasing and a fleet management system	

	Short Description	Timeline
13	Encourage County employees to use an existing free private platform for carpooling and ridesharing.	

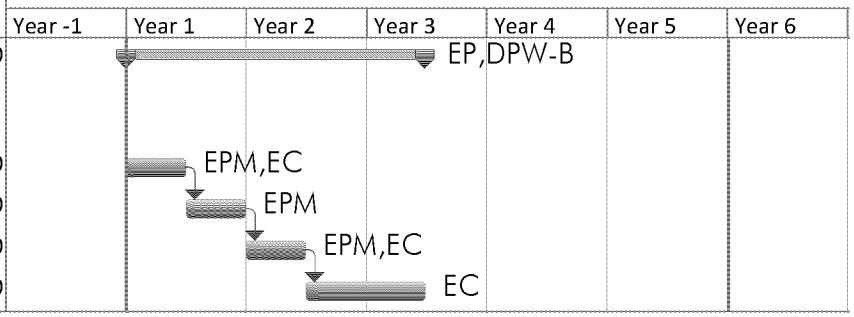
Renewable Electricity

1	Devote additional resources to representing the County's interest in Public Utilities Commission proceedings	

2	Introduce an expedited permitting process for small solar photovoltaic systems.	

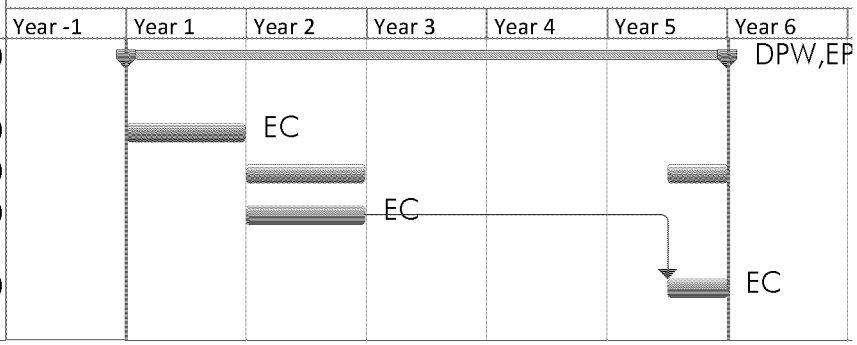
	Short Description	Timeline
3	Institute a county-level review process for geothermal exploration and development that includes a public hearing and ensures a project is not materially detrimental to the public welfare.	
4	Expand the definition of the Geothermal Asset Fund and the Geothermal Relocation and Community Benefits Fund to address any future geothermal development.	

	Short Description	Timeline
5	Release a master request for proposals for renewable energy generation and energy efficiency for all public facilities	Task Name / Cost (Savings): Release a master request for proposals for renewable energy projects for all public facilities $0; Develop RFP $0; RFP response period $0; Proposal evaluation $0; Install generation equipment $0



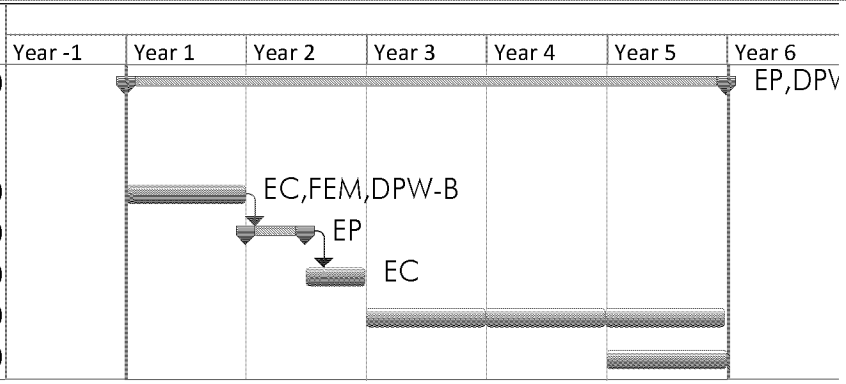
Energy Efficiency

1	Adopt and maintain strong building energy codes	Task Name / Cost (Savings): Adopt and maintain strong building energy codes $8,000; Draft code ordinance preparation $0; Review and adapt new codes $8,000; Review and adapt new codes (including training) 1 $4,000; Review and adapt new codes (including training) 2 $4,000



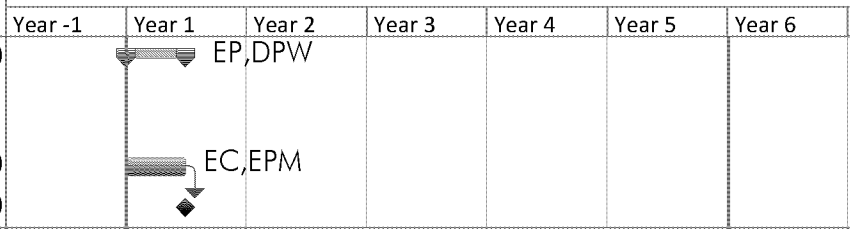
	Short Description	Timeline
2	Create a building energy performance rating and disclosure program	

Task Name	Cost (Savings)
Create a building energy performance rating and disclosure program	$14,500
Rating system selection	$0
Rating pilot with County buildings	$6,000
Rating pilot with large commercial buildings	$0
Commercial building rating program	$6,000
Residential building rating program	$2,500



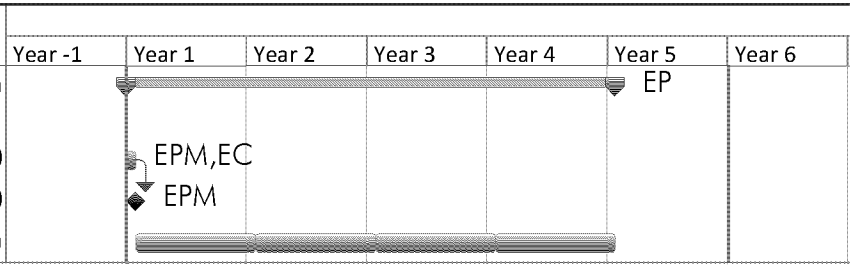
3	Require independent commissioning for all new large commercial construction projects and major renovations	

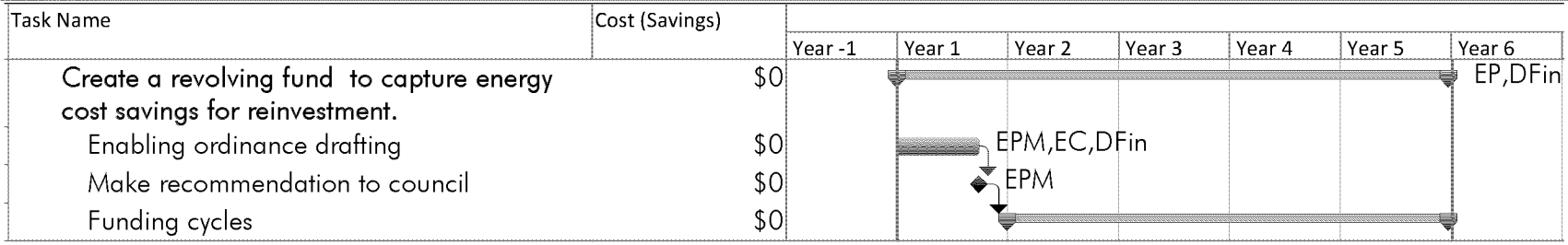
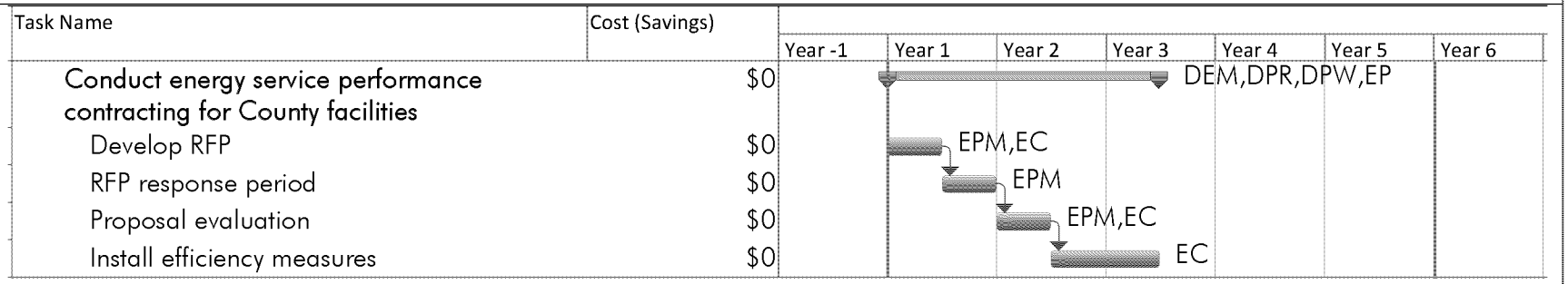
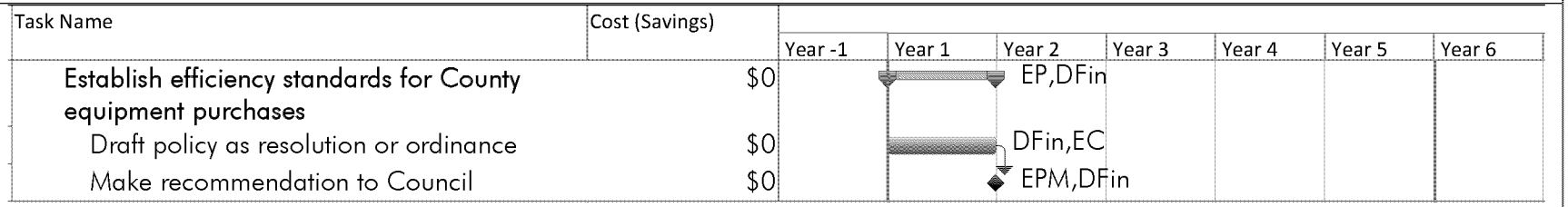
Task Name	Cost (Savings)
Require independent commissioning for all new large commercial construction projects and major renovations	$0
Ordinance drafting	$0
Submit to Council	$0



4	Restrict the solar water heater tax credit to existing buildings	

Task Name	Cost (Savings)
Restrict the solar water heater tax credit to existing buildings	($140,000)
Draft ordinance	$0
Make recommendation to council	$0
Lost revenue reduction (4 years)	($140,000)



	Short Description	Timeline
5	Create a revolving energy fund to capture energy cost savings for reinvestment	
6	Conduct energy service performance contracting for County facilities	
7	Establish efficiency standards for County equipment purchases	

Appendix C: Energy Program Planning

Energy policy planning and program development should be a predictable recurring process. It should be aligned with other key planning processes in the County and the State to effectively produce desired outcomes. Further, demonstrating the value of the energy program is extremely important for its continued success.

Clear objectives and good reporting are paramount. The Energy Program does not need to be held to a higher level of scrutiny than other County operations, but should serve as an example of transparency and accountability. If the County Council acts to create the energy program by ordinance, a planning and reporting timeline should be included as is done in several parts of the County Code.

Because energy policy affects every single department and would not carried out exclusively by the energy program, the regular planning activities will be collaborative. The recommended planning timeline is displayed Appendix B: Recommendation Timelines and described in detail below. Similar to the structure of this document, the planning timeline is based on a five-year planning cycle with annual action plans, reporting and assessment. If the framework developed in this document is used continuously, the administrative demand of continuous reporting and updating should be minimized.

Immediate Considerations

Planning and execution of the Energy Plan did not follow the timeline displayed above. The final draft will be released at or after the end of the current fiscal year (FY2011-2012), after the county budget has been completed and the State Legislature has adjourned. Any recommended actions that may require funding will likely have to be postponed until they can be included in the next budget cycle, perhaps even the creation of the energy program itself. The Five Year Roadmap is meant to be flexible in terms of start date for any new policy or program and will still be functional if delayed. The 1-year Action Plan is less flexible but, as described below, will be updated regularly. The 1-year Action Plan included with this document comes from an attempt to account for the timeline misalignment.

Annual Cycle

The annual energy planning cycle is akin to budget planning that takes place for the County as a whole. The energy program staff should produce four major planning documents every year:

- Annual Plan
- State legislative priorities report
- Legislative outcomes report
- Year-end (fiscal) report

	Date
Draft annual plan	December 31
Legislative priorities	November 1
Interdepartmental program coordination, plan revision	December through May
Annual plan and budget to council (first)	March 1
Annual plan and budget to council (final)	May 5
Legislative outcomes report	One month after close of session
Annual plan with approved budget	July 1
Year-end (fiscal) report to mayor and council	August 15

TABLE 17. KEY ENERGY PROGRAM PLANNING MILESTONES

Annual Plan

County departments complete a very brief annual activity overview as part of the budget process. This is typically the only publicly available account of planned activities, other than some long-range planning documents for a few departments (i.e. the 20 Year Water Plan). The budget document may also include a list of recent accomplishments.

Because energy is a policy priority for the county, a thorough annual plan would be extremely valuable. The energy program staff should keep the administration, County Council and public informed of progress and setbacks for County goals and energy on the island in general. Annual planning should be tied to the fiscal year and budget development process. Each annual plan should include four elements:

- The 1-year Action Plan would detail the activities of the Office and affiliated departments for the coming fiscal year. It essentially would be a supplement to and description of the budget.
- An updated five-year planning horizon that includes both content from the original Five Year Roadmap and any new developments. This is only a one-year extension of the existing Five Year Roadmap and is distinct from the comprehensive update of the Roadmap.

- The proposed budget for the Office in the format prescribed by the administration for all departments.
- The previous year-end report and a supplement describing recent developments.

Because this plan involves interdepartmental cooperation and implementation, the total expenditures and revenues in the annual plan would not be the same as for the Office. Each affected department's budget should reflect the annual plan. The activities described in each annual plan would be subject to the same approval process as any departmental budget.

The County's budget rules only require a three-year outlook for each annual operating budget. The Office should comply with this outlook where a five-year outlook would disrupt the structure of the overall county budget. However, a five-year projection of *current programs* should be provided in the narrative sections of the annual plan. The planned completion date from the draft annual plan is set to be the same time as the Comprehensive Annual Financial Report (CAFR). This means the Office must coordinate directly with the Department of Finance during this period so both documents can be accurate and in agreement.

The organization of the annual plan should be as consistent as possible from year to year. This may include a matrix or list of key topics of concern with prior year developments. Any new activities proposed should conform to the structure of the current Five Year Roadmap priority actions. The elements for estimating resource requirements and tracking success are particularly important. This way, they can be easily integrated into the subsequent reports and plans.

Drafting should begin in October after the year-end report is completed. The first draft should be ready for beginning of the calendar year and the budget development process. The Office would continue to coordinate the annual plan with departmental budgeting. A complete document would be submitted to the County Council along with the budget by March 1.

Legislative Reporting

State law can strongly dictate the authority of counties to implement new policies and programs and utilize revenues. A key function of the energy program is to represent the interests of the County in state policy development. In recent years, a large number of energy-related bills have been introduced in both houses of the legislature. The County already monitors and participates in the state legislative process, but does not clearly coordinate its energy agenda.

To prepare for the opening of legislative session each January, the Office should produce and make public its legislative priorities by November 1st. The priorities should be consistent with the long-term goals of the county as described in the Plan or otherwise adopted by the County Council and the administration.

The County does not have the ability to introduce bills but can draft language independently and provide it to legislators. Individual senators and representatives may publicize their legislative priorities in advance of the legislative session. The Office should coordinate with the island's delegation to provide supporting analysis and suggested language for new bills.

A second mechanism for the County is to submit official testimony to bills under consideration.[68] Until the bill submission deadline, the potential slate of bills to be considered cannot be completely known. Additionally, bills can change substantially through amendments and revision. The Office will need to react to unanticipated bills and amendments on an ongoing basis.

After the legislative session concludes in May, the Office should report to the administration and the County Council on the impact of any new laws or resolutions. Unfortunately, the County Code specifies that the last opportunity to amend the budget is "within ten working days after the close of the state legislature but not later than May 5 of each year."[69] This may leave a very short period of time for the Office to amend the annual plan if any new act would substantively impact it.[70] Fortunately, the legislature provides very detailed web-based measure tracking so the potential impacts may be anticipated.

One month after the close of the legislative session, the Office should complete a thorough *Legislative Outcomes* report for the administration and the County Council on the success of County participation and the impacts of new legislation on the energy program.

Year-end Report

The county budget process begins well before the end of the fiscal year. Also, the most recent full fiscal year data is several months old by the time a new budget is considered by the County Council. The administration, County Council and the public should have an opportunity to review energy program progress soon after the end of the fiscal year through a year-end report including:

- an evaluation of fiscal year program success based on measures and indicators specified in Five Year Roadmap;

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[68] For example, the County opposed HB2121 in the 2012 session. The bill would have banned state and county agencies from installing privately owned generating equipment (e.g. through a power purchase agreement) from a provider who had claimed the state renewable energy tax credit. The bill was later changed to be related to net metering.

[69] Section 10-2(a)

[70] For example, HB2358 of the 2012 session as introduced would have removed the ability of the counties to adopt their own building codes. This may have significantly impacted any ongoing or planned activities in the counties. The bill was later amended to not include any changes to the building code process.

- a summary of County energy consumption, production and costs;
- updated island energy data and trends;
- relevant state and federal policy developments;
- a summary of participation in Public Utilities Commission dockets; and
- a summary of participation on boards or committees.

The report will also lay the groundwork for creating the annual plan and developing the legislative priorities. The organization of the report should be consistent with the Five Year Roadmap and annual plan so progress can be tracked and compared.

This document would be produced ahead of the December 31st Department of Finance deadline for the CAFR, and so any financial calculations will only be estimates based on monthly data. When revised for the annual plan, the year-end report should reflect the data from the CAFR.

Data Collection

Creating a complete picture of the County's energy use is limited by the current recordkeeping practices. The energy program manager should assist the County's facilities managers in upgrading and centralizing the systems in place to track electricity and fuel consumption and expenditures. The Department of Water Supply budgets and reports energy consumption and expenditures separately from other County departments.

Cataloging the County's energy meters and recording the details of monthly bills in a central database can immediately improve electricity data collection. The minimum of such information is displayed in Table 18. Bills may still be collected through DPW and payment would still need to be handled by the Department of Finance.

Meter information	Bill information
Account number	Date
Facility name	Account number
Facility address	kWh
Equipment metered	Multiplier (if applicable)
Rate schedule for account	Energy charge
	Customer charge
	Demand charge (if applicable)
	Other charges
	Total charge
	Net cost per kWh (calculated)

Table 18. Minimum data collection for County electric meters

Fuel consumption data for County operations is similarly dispersed. The most recent comprehensive assessment of the County fleet is from FY2008–2009. More frequent manual collection may be extremely time consuming for County staff. Fortunately there are numerous fuel management systems on the market that

collect at least fuel consumption and recorded mileage verified through GPS for all vehicles. A related pilot is underway at the Department of Water Supply. HELCO reports that its fuel management system has already paid for itself through 20% lower consumption and better vehicle maintenance and replacement (a more modest 10% of County expenditures would generate $750,000 in savings every year).

Additional data points that can be collected from County processes include:

- Installations and capacity of distributed generation and solar water heating through building permits;
- Specific make, model, year and mileage data through vehicle registrations;
- Building energy performance ratings

Five Year Cycle

Although the Office will be regularly assessing changes in the policy landscape and trends in the island's energy system, significant changes may occur over longer timeframes that warrant reevaluation of the strategic direction of the County's energy program. To address this, the county should undertake comprehensive review of the County of Hawai'i Energy Sustainability Plan on a five-year cycle.

Unlike the annual plans, the update to this plan should reevaluate not just the energy program's operational activities, but also all of the plan's major elements including the long-term vision, guiding principles and planning objectives. Perhaps the key difference between the annual five-year outlook updates and a new Five Year Roadmap is a substantial stakeholder and community engagement process. As with the development of this plan, stakeholder and community engagement can be used to assess the validity of goals and objectives, the effectiveness of current programs and to find opportunities for systemic improvement.

The County should not take a "blank-slate" approach to creating a new plan. Continuity from past planning and reporting will be valuable for measuring success. The review process may require additional resources such as a consultant to allow other aspects of the energy program to continue.

If this plan is adopted by the County starting around January 2013, then the original Five Year Roadmap will conclude around December 2018. The County should initiate a comprehensive review of the plan at least one year prior to the planned end date of the preceding Five Year Roadmap. For example, the process for the next version of the plan taking effect in December 2018 could begin in January 2016 and be submitted to the Council by January 2017. In a year with a

comprehensive Plan review, the annual plan should not include a separate update to the five-year roadmap.

It would be valuable to align the County of Hawai'i Energy Sustainability Plan comprehensive review with the process for the General Plan. The last General Plan was adopted as ordinance (05-25) on February 9, 2005. The plan specifies that it should undergo a comprehensive review to "be submitted to the County Council not more than ten years after the date of adoption of the previous amendments resulting from a comprehensive review." This would imply a deadline of February 9, 2015.

To be aligned with the General Plan, the first comprehensive County of Hawai'i Energy Sustainability Plan review may need to occur before the first Five Year Roadmap has concluded. This timeline would be about two years in advance of a timeline starting July 2012. Although it may seem premature shifting the five-year planning cycle may have two advantages: (1) state and federal law and state regulations are rapidly changing; and (2) the 2012 County of Hawai'i Energy Sustainability Plan was not produced along the timeline recommended in this section.

	Current timeline	Aligned with General Plan
Plan release	January, 2013	July, 2012
Begin comprehensive review	July, 2016	January, 2014
Submit to County Council	July, 2017	February, 2015
New Plan release	January, 2018	July, 2015

TABLE 19. COMPARISON OF GENERAL PLAN AND FIVE YEAR PLANNING CYCLES DATES

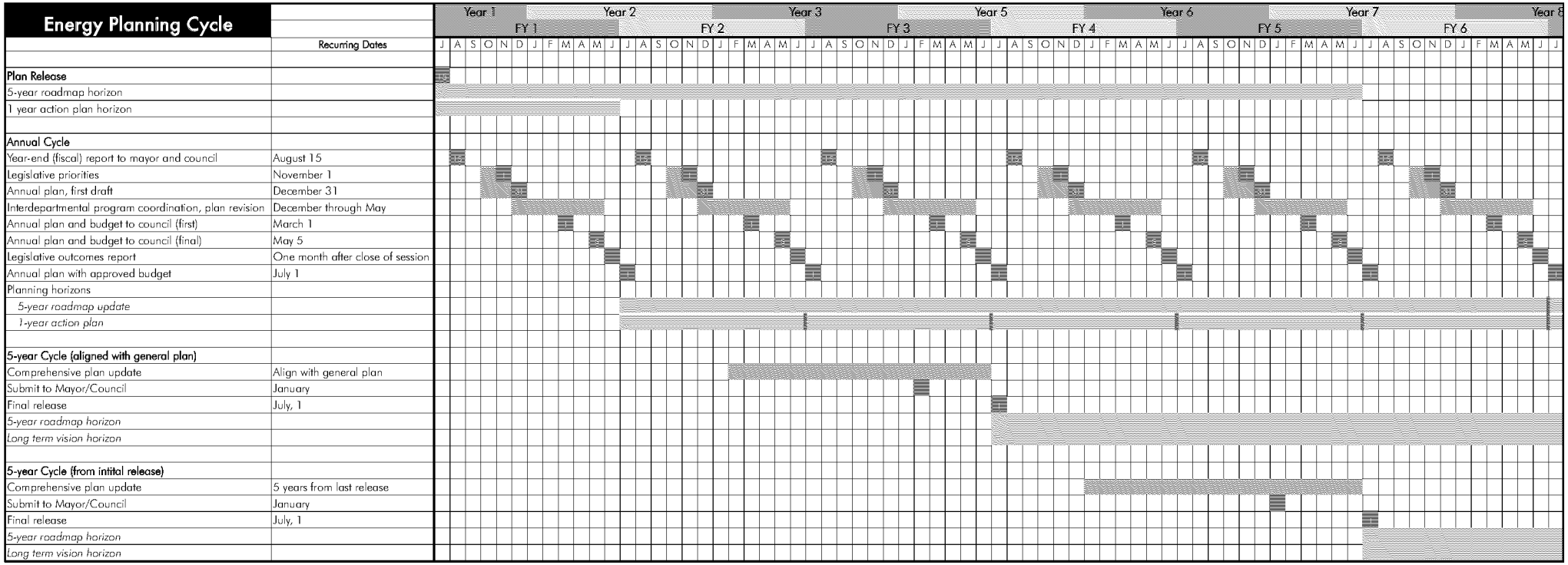

FIGURE 54. PROPOSED ENERGY PLANNING CYCLE

Appendix D: Energy Program Structure Options

The County may choose to structure the energy program in a number of ways. The staff duties could be fulfilled by employees, contractors, or a combination of the two. This section presents three structure options for how to place the department within the County government based on precedent and existing rules and regulations.

Option 1: New Department or Agency

A completely new legal unit of the executive branch of the County government.

Authority

There are four types of county governmental unit that are applicable here. The Managing Director oversees each in some capacity.

1. **Departments** headed by directors appointed by the mayor are established by the County Charter. There are currently nine departments, including Research & Development.
2. **Agencies** are created by the County Code and are administered as defined in the Code. None of the four current agencies are led by direct appointees of the Mayor, though this is not explicitly excluded as a possibility. The Mass Transit Agency is an example. It was formerly headed by an appointee.
3. **Departments under commissions** are created by the County Charter and headed by appointees approved by their commission. The commission members are appointed by the mayor and approved by the council for terms of five years (Section 13-4) unless otherwise specified. The Department of Water Supply and Police Department are examples.
4. **Committees and commissions** can be created by the County Charter or Code to work with departments, but are typically only advisory. Members are appointed by the mayor but cannot be removed by the mayor. Members serve terms of five years unless otherwise specified. The Environmental Management Commission is an example.
5. **Advisory Commissions** can be created by the mayor under Section 4-4 of the Charter but cannot exist beyond the term of the mayor. They also cannot have employees but may utilize the resources of the relevant department or agency. The Energy Advisory Commission is an example.

Analysis of Option 1: New Department or Agency

Keeping with the previous statements about the value of mayoral appointee overseeing energy and sustainability policy, the "department" structure would be the most effective of the four options above. An "agency" would also be a good option if it were headed by an appointee as well. However, the common practice is for agency heads to be chosen through other means, including civil service recruitment. It is also likely an agency head appointee would not be considered part of the cabinet.

Creating a full department would require amending the County Charter. Amendments are initiated by a two-thirds vote of the council members and enacted by a countywide public vote. This would be a longer process than creating an agency, which can be accomplished by simple majority vote of the County Council amending the County Code.

The title of the energy program manager could look to either existing usage for department and agency heads or use an alternative title. Most department heads are titled "Director," including the Office of Management. Agency heads are titled "Administrator", except for the County Executive on Aging. In this context, using the title of "Director" for the energy program manager may be more appropriate if it is an appointed position.

If the position is to be in the civil service, the title of "Administrator" could be used, but may communicate less of a coordinating authority. This title is also used for several positions in the Department of Finance. Titles such as "Manager" and "Supervisor" are also in use throughout the civil service but may cause confusion if used for an appointed position.

A department under a commission would add unnecessary administrative costs and complexity. This type of organization is more often reserved for departments that provide a distinct public service and need additional oversight, such as the Police Department and the Department of Water Supply.

A committee or advisory commission generally holds no authority to carry out any actions and so could not effectively implement energy and sustainability policies and programs independent of a department or agency. Dedicated departmental staff could be assigned to a commission to circumvent the preclusion of it having direct employees.

A Department of Energy Sustainability was previously proposed to the County Council in 2008 with Bill 314, but did not pass. Despite using the template of a department, it was proposed that it be created by amendment of the County Code and not the County Charter. According to Food and Energy Security Committee report dated June 17, 2008, the Corporation Counsel approved this approach. A

later proposed amendment would have changed the title from "Department" to "Office" but was not included in the final bill.

An Energy Sustainability Advisor, unlike the directors of most other departments, would have headed the proposed office. The Energy Advisory Commission would have moved from the Department of Research & Development to the new department.

Option 2: Office of Management

An individual energy program manager with responsibility for energy and sustainability polices and programs across all departments and agencies or such an appointee and supporting civil service employees.

Authority

Under HRS §76-77, the mayor has the authority to appoint civil service exempt employees to the Office of the Mayor, as department heads and as assistant or deputy department heads. However, Article 2 of the County Code specifies that the office the mayor "shall be composed of the mayor and the managing director." This implies other appointments are excluded, although it is not explicitly stated. Because of the limitation in HRS §76-77, these unconventional appointments would presumably be subject to the Department of Human Resources civil service classification and pay plan.

In practice, the Office of Management serves as the Office of the Mayor and is headed by the Managing Director. There are also executive assistants within the Office, who are appointed by the mayor, but there is no specific provision for this in the Charter or Code. Since the County Council must approve appropriations to fund all employees, this action by the mayor seems to be part of common practice.

Departments, including the Office of Management, are created by the County Charter but can be further refined by the County Code. For example, the Department of Public Works has several divisions and associated responsibilities defined in Section 2-41 of the Code.

Maui County's charter and code do not create either the Office of Economic Development or the Energy Office; they exist within the Office of the Mayor (see below). Maui County's charter differs from Hawai'i County's charter in that it does not imply a limit on the Office of the Mayor to two positions but can include "necessary staff."

Analysis of Option 2

It would be valuable to have a coordinating energy and sustainability position or staff working closely with the Managing Director, who has broad authority to

coordinate departments and agencies. Despite the use of a similar approach in Maui County (see below), it may not be viable for Hawai'i County. HRS §76-77 allows the mayor to create a new appointed energy and sustainability position if the position is in the Office of the Mayor, but the Hawai'i County charter implies the Office of the Mayor can have just two employees.

If it is determined that the charter does preclude the mayor from appointing more than two positions to the Office of the Mayor, the County Council could enact an ordinance creating a subdivision of the Office of Management for energy and sustainability instead. Again, under HRS §76-77, an appointee could not head this new subdivision because it would not be in the Office of the Mayor.

Alternatively, the County Council could enact an ordinance to amend the County Code and allow the Mayor to create a division for energy and sustainability within the Office of the Mayor, though this option may be undesirable if it is regarded as unduly increasing the power of the mayor at the expense of other departments or the Council.

Option 3: Formal Office within the Department of Research & Development

Create a subdivision within the Department of Research & Development with responsibility for energy and sustainability policies and programs. This approach could be used as a transitional form before pursuing Option 1 or 2.

Authority

As mentioned above, departments are created by the County Charter but can be further refined by the County Code. For example the Department of Public Works has several divisions and associated responsibilities defined in Section 2-41 of the code.

Analysis of Option 3

The County Council could create a formal office or division within the Department of Research & Development by amending the County Code. The division head could not be an appointed position but could be granted a higher-level management title. However, this may limit the ability of the new division to coordinate across other departments, since the division head would not be considered a cabinet-level position. To help offset the problem, the responsibilities outlined in the Code could include some special authorities. There is not an exact existing precedent for this approach; however more traditional coordinating functions are carried out, for example, by the Department of Finance, the Department of Human Resources, and the Automotive Division of the Department of Public Works.

Appendix E: Currently Planned Activities

From the March 1 budget submission to the County Council for FY 2012 – 2013:

- Initiate an electric vehicle program for County of Hawai'i by June 2013.
- Issue award and complete Lalamilo Wind Farm project, working in conjunction with the Department of Water Supply, by June 2013.
- Initiate and partner with NELHA for Renewable Research Development and Deploy projects by June 2013.
- Identify and facilitate at least two (2) transportation projects, in conjunction with Department of Public Works and Mass Transit that will help reduce the cost of energy for the county and reduce emissions by June 2013.
- Continue to work with Hawaii Energy (SAIC) to implement at least two (2) energy efficiency programs to increase energy efficiency (decrease kilowatt hours) for residents by June 2013.
- Represent Hawai'i County in Hawaii Electric Light Company's (HELCO) Integrated Resource Planning (IRP) process, in Public Utilities Commission (PUC) dockets, on the Board and Research Advisory Committee of the Natural Energy Laboratory of Hawai'i (NELHA), the Board of the Hawai'i Energy Policy Forum (HEPF), the Board of the Hawai'i Clean Energy Initiative Steering Committee and at the Hawai'i State Legislature by attending scheduled meetings by June 2013.
- Update the County' s Energy Emergency Preparedness Plans as the State of Hawai'i Plans are updated by June 2013. Assist Hawai'i County Civil Defense during emergencies and energy situations. Attend meetings of the Governor' s Energy Emergency Preparedness Advisory Council and the Hawai'i State Energy Council by June 2013.
- Update the energy section of the Hawai'i County Building Code—IECC 2009 by June 2013.
- Monitor energy savings and maintenance contracts on retrofits under new performance contracts by June 2013.
- Work with Department of Public Works to ensure all new County of Hawai'i facilities are LEED certified and, where feasible, include the installation of solar photovoltaic power by June 2013.
- Implement portions of the County of Hawai'i Energy Sustainability Plan, especially renewable energy projects and transportation/fuel projects by June 2013.

Appendix F: Indicators and Data Sources

In the transportation sector, the primary sources of data are the State of Hawaii Department of Taxation, Department of Transportation, and Department of Business, Economic Development, and Tourism (DBEDT). These agencies collect and report information related to liquid fuel sales, estimates of vehicle miles traveled, and selected liquid fuel pricing data. DBEDT collects much of the data that is independently reported and presents it in a more accessible format (DBEDT Monthly Energy Trends). The County of Hawai'i reports information on other aspects of the transportation system, including data on the Mass Transit Agency and financial information related to the County owned roads and County transportation system construction and maintenance.

In the electric power sector, the primary source of data is Hawaii Electric Light Company, Inc., the owner of the island's power system and currently the only retail provider of electric power service. The company reports data on the island's power system to the State of Hawai'i Public Utilities Commission (PUC) and to the US Department of Energy, Energy Information Administration (EIA). DBEDT also collects some statistics that are reported to the PUC and presents them in the Monthly Energy Trends report. HELCO's parent company Hawaiian Electric Company, Inc. is in turn owned by Hawaiian Electric Industries, Inc. (HEI), which is publicly traded on the New York Stock Exchange, and reports financial information to the US Securities and Exchange Commission.

Data	Source	Link (if available)
Transportation		
Liquid fuel consumption	DBEDT Monthly Energy Trends	http://hawaii.gov/dbedt/info/economic/data_reports/energy-trends
Vehicle miles traveled	DBEDT Monthly Energy Trends	http://hawaii.gov/dbedt/info/economic/data_reports/energy-trends
Gasoline and diesel pricing	DBEDT Monthly Energy Trends	http://hawaii.gov/dbedt/info/economic/data_reports/energy-trends
Aviation fuel pricing	Estimated from EIA West Coast PADD 5	http://www.eia.gov/petroleum/data.cfm#prices
Mass Transit Agency ridership	County of Hawai'i Annual Financial Report	http://records.co.hawaii.hi.us/weblink/1/doc/18308/Page1.aspx
County transportation system investments	▪ County of Hawai'i Annual Financial Report ▪ County of Hawai'i Annual Budget	http://records.co.hawaii.hi.us/weblink/1/doc/18308/Page1.aspx http://www.hawaiicounty.gov/finance-budget/

Data	Source	Link (if available)
Number of vehicles, by type	DBEDT State Data Book	http://hawaii.gov/dbedt/info/economic/databook/
Number of licensed drivers	DBEDT State Data Book	http://hawaii.gov/dbedt/info/economic/databook/
Electric Power		
Electricity sales, by type and electricity pricing (revenues)	▪DBEDT Monthly Energy Trends ▪EIA-826 survey	http://hawaii.gov/dbedt/info/economic/data_reports/energy-trends http://www.eia.gov/cneaf/electricity/page/eia826.html
Power system net generation, by facility	▪DBEDT Monthly Energy Trends ▪EIA-923 Survey	http://hawaii.gov/dbedt/info/economic/data_reports/energy-trends http://www.eia.gov/electricity/data/eia923/
Primary energy consumption for power generation, by facility	EIA-923 Survey	http://www.eia.gov/electricity/data/eia923/
Electric utility financial information (expenses, profits, capital investments, etc.)	▪Hawaiian Electric Industries, Inc. 10-K filed with SEC ▪HELCO Annual Financial Report filed with PUC ▪HELCO Annual Capital Expenditures Budget and Forecast filed with PUC	▪http://phx.corporate-ir.net/phoenix.zhtml?c=101675&p=irol-sec ▪(contact PUC) ▪(contact PUC) ▪
Electric power generation capacity and reserve margin	▪HELCO Adequacy of Supply Report filed with PUC ▪EIA-860 Survey	▪(contact PUC) ▪http://www.eia.gov/cneaf/electricity/page/eia860.html
Net metering and Feed-in Tariff capacity	▪HELCO Annual Net Metering Report filed with PUC ▪HELCO Annual FIT Report filed with PUC ▪EIA-861 Report, File 5	▪(contact PUC ▪(contact PUC) ▪http://www.eia.gov/electricity/data/eia861/index.html
Power outages and electric system reliability	▪HELCO Annual Service Reliability Report filed with PUC ▪HECO Reliability Standards Working Group Monthly Report filed with PUC, Docket #2011-0206	▪(contact PUC) ▪http://dms.puc.hawaii.gov/dms/ ▪
Curtailment of renewable resources	HELCO Monthly Curtailment Report filed with PUC, Docket #2011-0040	http://dms.puc.hawaii.gov/dms/

TABLE 20. DATA SOURCES

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