Hawaii Refinery Task Force

Final Report

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Hawaii Department of Business,
Economic Development & Tourism

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List of Acronyms and Definitions

b/d	Barrels per day
Blendstocks	Motor gasoline blending components that are to be blended with oxygenates to produce finished gasoline. This can also refer to foreign gasoline that does not meet U.S. specifications and must be blended or re-refined to be sold in the United States.
DBEDT	The Hawaii Department of Business, Economic Development, and Tourism
Demurrage	Costs incurred for delaying the loading or unloading of a shipping vessel; caused by a range of factors such as busy channels, occupied berths, lack of shore tankage, etc.
DG	Distributed generation
DOE	U.S. Department of Energy
E10	Gasoline composed of a certain proportion of fuel ethanol. E10 indicates gasoline with ethanol content between 5 percent and 10 percent.
EIA	U.S. Energy Information Administration
EIIRP	Energy Industry Information Reporting Program
EPA	U.S. Environmental Protection Agency
EV	Electric vehicle
GHG	Greenhouse gas
GWh	Gigawatt hour
HECO	Hawaiian Electric Company, Inc.
HELCO	Hawaii Electric Light Company, Inc.
HFFC	Hawaii Fueling Facilities Corporation
HIBOB	Hawaii blendstock for oxygenate blending
HRTF	Hawaii Refinery Task Force
ISO	International Organization for Standardization
ISO container	Intermodal shipping container with ISO-standardized dimensions and markings.

KBPH	Kalaeloa Barbers Point Harbor
KIUC	Kauai Island Utility Cooperative
KPLP	Kalaeloa Partners, L.P.
LNG	Liquefied natural gas
LSD	Low sulfur diesel
LSFO	Low sulfur fuel oil
Mbbl	Thousand barrels
Mcfd	Thousand cubic feet per day
MECO	Maui Electric Company, Ltd.
mgy	Million gallons per year
MMcf	Million cubic feet
mpg	Miles per gallon
MWh	Megawatt hour
ppm	Parts per million
PHEV	Plug-in electric vehicle
PUC	Hawaii Public Utilities Commission
SEO	Hawaii State Energy Office
SNG	Synthetic natural gas
SPM	Single point mooring
tpa	Metric tonnes per annum
VMT	Vehicle miles traveled

Executive Summary

This is the third and final report of the Hawaii Refinery Task Force (HRTF), which was established by Executive Order in 2013 to assess the impacts of changes in Hawaii's refinery capacity and provide advice and recommendations to Governor Abercrombie and the Department of Business, Economic Development & Tourism on matters involving a future fuels ecosystem. The Task Force's first report (hereafter referred to as the *Initial Report*), issued in June 2013, focused on evaluating the impacts of the potential closure of Tesoro's Kapolei refinery on Hawaii markets and recommended actions for mitigating the risks of price anomalies and supply disruptions. Following the sale of the Tesoro refinery to Par Petroleum, the Task Force issued its second report (referred to as the *Interim Report*) in November 2013, which focused on several challenges to the sustainability of ongoing refinery operations in Hawaii and explored options to mitigate the impacts of potential refinery closures.

The *Interim Report* concluded that one or both of the state's refineries are likely to close by 2020 and, since Hawaii will still be heavily dependent on fossil fuels over the coming decades, emphasized two sets of actions needed to help ensure a smooth transition toward the state's future energy ecosystem: (i) working to resolve several specific regulatory challenges that are having significant impacts on the refineries; and (ii) maintaining access to and making improvements to critical fuels infrastructure, particularly the import infrastructure needed to sustain supply should one or both refineries close. This *Final Report* builds on the findings contained within the first two volumes and provides recommendations on specific transitional measures needed through 2020.

Estimated Fossil Fuel Demand Reductions

This *Final Report* begins by providing an updated estimate of the reductions in fossil fuel consumption resulting from conservation measures and fuel switching in both the power and transportation sectors, and provides estimates of total petroleum demand through 2020. Analysis of the state's substantial progress toward meeting its Hawaii Clean Energy Initiative (HCEI) goals found that the combination of energy efficiency savings, significantly increased distributed generation, and likely new utility-scale renewable generation are expected to reduce petroleum product consumption in the power sector by 18,500 b/d by 2020 (or 53% of 2012 actual consumption).

In terms of the impact of liquefied natural gas (LNG), the *Final Report* assumes that the Hawaii Gas initiatives for development of limited ISO container imports, which has been approved by the Hawaii Public Utilities Commission (PUC), will be in place by 2020. This development would have relatively modest impacts on petroleum product demand, displacing approximately 100 barrels per day (b/d) of naphtha by 2015 and up to 300 b/d by 2020. This report also discusses several alternative approaches to LNG importation currently being discussed in Hawaii (e.g., the consortium approach to bulk import, HECO's recent RFP for large-scale import of ISO container) and discusses their potential impacts. Implementation of larger volumes of LNG prior to 2020 would create additional displacement of fossil

fuel demands and likely hasten the closure of one or both refineries, due to the need to heavily discount surplus products for export markets. Furthermore, accelerated increases in LNG supply for power generation could have unintended consequences on local distribution infrastructure, grid management, and HCEI implementation. As such, the PUC, DBEDT, DOT, and other stakeholders will need to carefully consider the timing and impacts of any plans to import increased volumes of LNG.

Hawaii's transportation sector, which currently consumes more than two times the amount of fossil fuels per year than the power sector (74,400 b/d in 2012, not including ethanol), is expected to experience only a modest decrease in demand for petroleum products by 2020. Federal CAFE standards will be the main driver over this period, reducing fossil fuel consumption by an estimated 2,500 b/d by 2020. Combined with other relevant trends in the state—including adoption of electric vehicles, increased use of biodiesel, and the anticipated production of bio-based jet fuel by Hawaii Bioenergy—total demand for petroleum products by Hawaii's on-road transportation sector is expected to decrease by only 3,600 b/d by 2020, or less than 5% of 2012 demand.

Transitional Measures through 2020

Overall, ICF's analysis found that, while demand for fossil fuels in the power sector is likely to decrease by more than 50% by 2020, there will be only modest demand reductions in the transportation sector and the state will remain heavily reliant on fossil fuels through the end of the decade and beyond. Furthermore, the potential closure of one or both refineries would create additional pressures on the state's fuel system, including increasing petroleum product imports and potentially rendering refinery-owned infrastructure inaccessible if not operated. As such, it is essential that key infrastructure and policies are in place so that a longer term transition to a new fuel ecosystem can occur in Hawaii. This *Final Report* focuses on two sets of actions needed to help maintain the stability of fuel supply and prices during this transition period: (1) measures to enhance the accessibility and flexibility of the state's critical fuel infrastructure; and (2) actions to manage key regulatory issues facing the refiners.

Measures to Enhance Fuel Infrastructure Flexibility

Access to Existing Infrastructure: *The state must ensure the continued operation of refinery SPMs, storage tanks, and pipelines, even with one or both refineries closed.*

While it is very likely that the critical refinery infrastructure would be purchased and operated by third parties should both refineries close, the state cannot be certain that the current refiners would continue to operate their assets and businesses (similar to the Tesoro transition process) until a buyer is found. Under such a scenario, the absence of an entity to import products through the SPMs, store the products at the refinery tank farms, and distribute product through pipelines to customers is the single biggest vulnerability the state has to the closure of the refineries.

The state's ability to respond to the threat of one or both refineries abandoning their assets is limited, however, possible options may include: (1) working now with both refiners to develop mutually agreed exit strategies which could, as an example, result in an agreement to ensure that the refiner would

operate their importing, storage, distribution, and marketing businesses for as long as necessary until a buyer is located; or (2) exploring options that the State may have by law to sustain the operation of the assets (e.g., importing, storage, distribution, and marketing) until a buyer is found. Given the possibility of refinery closures and the transformations taking place in Hawaii's energy supply, the state may wish to consider alternative options to effectively manage and drive these actions across the various agencies and parties impacted.

Kalaeloa Barbers Point Harbor (KBPH): *The KBPH study team should continue to work closely with the State Energy Office as the harbor plan develops, and ensure that propane offloading capacity is included at the Fuel Pier.*

If one or both of the state's refineries close, imports at KBPH will increase, particularly for products such as naphtha and propane, since the refineries will no longer be producing those products. In the event that Hawaii is forced to rely exclusively on imports to meet petroleum product demand, KBPH may become an even more integral part of the state's supply chain. The KBPH study team is wisely assuming a higher traffic outlook for these products in its ongoing planning and design activities. In addition, the Task Force recommends that the KBPH team ensure that the new fuel pier include capacity to unload propane vessels, which would need to increase in the event of refinery closures.

Fuel Reserve: *Consider implementation of a modest fuel reserve for selected products.*

In the event of refinery closures and the transition to import based fuel supply, the Hawaii supply chain will extend a great distance—to Asian or mainland markets, or even further—thereby affecting the state's ability to quickly procure fuels to respond to emergency situations that might occur. In such a scenario, Hawaii may benefit from creating a modest fuel reserve for gasoline and diesel fuel for transportation, wherein it would lease storage capacity, purchase a certain amount of fuel to be held as reserve (e.g. 200,000 barrels), and establish criteria for specific situations that would permit the release of the reserve, such as providing fuel to first responders and restoration teams following emergencies or natural disasters. Further investigation is warranted by the state to determine the appropriate fuel types, size, placement, and ownership options for any new fuel storage facility or facilities to ensure open and fair access of a diversity of fuel options to various players in the market.

Hawaii Gasoline Specifications: *The state should enact pending legislation to modify Hawaii's gasoline specifications so that parties importing gasoline into Hawaii do not require unique blends at higher costs.*

House Bill 1938 was introduced on January 21, 2014 by Representative Chris Lee. Adoption of the bill, or immediate promulgation by the Hawaii Department of Agriculture to update the gasoline specifications, would allow Hawaii fuel suppliers to negotiate for imported gasoline volumes without requiring domestic or foreign suppliers to conform to Hawaii's outdated gasoline specifications, which have never been modified to account for the fact that gasoline now requires 10% ethanol. As of March 2014, the bill has crossed from the House to the Senate and appears to be on a path toward being enacted, which will help position Hawaii to meet potential gasoline import needs more cost effectively. The Task Force

believes that updating the gasoline specifications by rule or statute is important to position Hawaii to meet potential gasoline import needs more cost effectively.

Pier 51A Prioritization Process: *A prioritization process should be implemented, under the supervision of DOT-Harbors, to ensure that Pier 51A can handle 3-4 cargoes of jet fuel per month in the event that all Oahu jet fuel requirements need to be supplied directly via imports*.

Current Honolulu International Airport demands require at least one cargo per month of jet fuel offloading at Pier 51A, and this could increase to 3-4 cargoes per month with both refineries closed. Given expected bottlenecks, it is recommended that DOT–Harbors work with HFFC and the container industry to put in place a delivery prioritization process. In cases where the outlook for jet fuel inventory could threaten fueling of jets, HFFC would demonstrate the impact based on cargo schedules, and DOT–Harbors would be able to provide jet cargo berthing priority.

Jones Act: *Explore actions to allow Hawaii fuel supply to utilize foreign flag vessels from domestic ports in lieu of Jones Act vessels to expand supply sources into the state at more competitive prices.*

Several stakeholders have raised the possibility of waiving the Jones Act requirement to use only U.S.-owned and operated vessels to deliver domestically produced fuels to Hawaii, in order to lower the cost of importing fuels in a situation where one or both of Hawaii's refineries close. While the approval of such a waiver would be challenging, the state should be positioned to prepare a request for a blanket waiver of the Jones Act for a fixed period of time after the closure of one or both refineries to help maintain supply assurance.

Energy Assurance Plans: *As part of the regular update and maintenance of Hawaii's Energy Assurance Plan (EAP), ensure that changing conditions such as the refinery closure potential, developing patterns of growing renewable supply and LNG imports, and evolving natural and manmade threats are addressed.*

Hawaii has an Energy Assurance Plan (EAP) that was developed several years ago with federal funding to assist the state in addressing energy emergencies and disruptions due to either weather or man-made events. Since this was developed, Hawaii has increased renewable fuel sources significantly and now faces a possible shift to an import-based fuels supply should refinery closures occur. Given this possible development, as well as the likely sustained growth in renewable power generation, the Task Force recommends that Hawaii assess the existing EAP and determine what changes may need to be made as Hawaii's energy supply profile transforms over the next decade.

Measures to Manage Regulatory Issues

Mercury and Air Toxics Standard (MATS): *Continue analysis of possible blending options and the impact on cost to refiners and consumers, as well as KPLP.*

On November 10, 2013, Governor Abercrombie sent a request to EPA Administrator Gina McCarthy requesting that the final EPA ruling for non-continental boilers be reviewed, due to the possibility that inaccurate test data had been used to establish the standard. EPA has not yet responded formally to this

request. However, on March 20, 2014, officials from EPA Region IX headquarters in San Francisco informed the state that the request is under consideration, although it was not known when a final determination would be made. In addition, it has been reported that HECO is working with the refiners to determine if there is a suitable blend of diesel fuel and low sulfur fuel oil (LSFO) which might reduce the particulate matter emissions to a level which could meet the existing standard from EPA. The Task Force recommends continued analysis of possible blending options and the impact on cost to refiners and consumers, as well as KPLP. The outcome of the EPA appeal may lead to different conclusions if a decision is made to modify the non-continental limits.

Federal Tier 3 Gasoline Specification: *Refiners should work with the state to confirm whether they meet EPA criteria for "small refiners" and determine what steps may be needed to meet the Tier 3 specification by either 2017 or 2020.*

The *Interim Report* identified a significant concern that Hawaii refiners will be required to produce gasoline with 10 parts per million (ppm) sulfur by 2017 as part of the EPA's proposed Tier 3 gasoline specification ruling. Based on the proposed ruling and the configuration of Hawaii's refineries, the *Interim Report* indicated that this could be a threat to the refineries, particularly Chevron, which has less reported hydrogen treating capacity to remove sulfur. On March 3, 2014, the EPA finalized the ruling requiring the lower levels of sulfur in gasoline by 2017, but it included an exemption from meeting the rule until 2020 for refiners who meet the defined category of "small" refiners (those that processed under 75,000 b/d in 2012). Chevron appears to meet these criteria and thus may be granted an exception for compliance until 2020. The HIE refinery does not believe that it meets the criteria and, if confirmed, will need to comply by 2017. The Task Force recommends that the refiners communicate with the state to confirm their categorization, and to advise what steps may be needed to meet the 2017 or 2020 requirement for Tier 3 gasoline. Given the very recent ruling and need for analysis of the rule, the state would seek individual meetings with the refiners to discuss plans by December 1, 2014.

State GHG Reduction Initiative: *Based on current trends and the planned progression of HCEI to further reduce electricity demand while increasing the share of renewable-based generation, Hawaii will likely be able to reduce GHG emissions 30% by 2020. Rather than introducing new rules, it may be as effective, and less burdensome, to use the HCEI framework to continue to drive emissions reductions, complemented by a rigorous monitoring process. If reductions are not achieved as expected over time, additional rules could then be promulgated by the state to serve as a backstop to HCEI implementation. The Abercrombie Administration should consider the range of stakeholder views on this alternative approach as it makes a final determination of the state GHG rules.*

Roughly 65% of Hawaii's reported GHG emissions in 2012—over 6.2 million metric tonnes of CO_2—stemmed from the burning of liquid fossil fuels for power generation (the percentage increases to 80% if

coal is included).[1] Driven largely by HCEI initiatives in energy efficiency and renewable generation, the projected level of liquid fossil fuel combustion for power generation is expected to decline by 18,500 b/d by 2020, from the 2012 level of 34,900 b/d. This reduction of over 50% could lower GHG emissions by over 3 million metric tonnes, assuming the continuing success in HCEI implementation.[2] This would enable the state to meet its overall GHG emission reductions goals of over 30% by 2020, even assuming essentially no change in refinery or coal fired GHG emissions.

It would appear that the success of the HCEI initiatives could, by 2020, achieve GHG reductions well in excess of those sought by Act 234, as amended, to achieve a 16% reduction from 2010 GHG levels. If HCEI initiatives continue to be successfully implemented, the imposition of specific measures on the refiners or other parties may be unnecessary beyond what is required to achieve the state's minimum GHG reduction goals, and it could contribute significant additional costs. Instead, what is critical is to ensure that HCEI initiatives continue moving forward to achieve the expected fossil fuel reductions by 2020, and that the state accurately monitors GHG emissions each year to ensure alignment of GHG emission reporting with HCEI progress. If reductions are not achieved as expected over time, additional rules could then be promulgated by the state to serve as a backstop to HCEI implementation.

As it makes a final determination of the state GHG rules, the Abercrombie Administration should seek to reconcile its approach with the projected GHG reductions from HCEI, consider the range of stakeholder views on this subject, and ensure consistency with its response to the federal rulemaking process on existing power plants (i.e., Clean Air Act Section 111d).

Conclusion

Since early 2013, the Hawaii Refinery Task Force has provided Governor Abercrombie with advice and recommendations on key issues related to the state's fuels ecosystem, including assessing the impacts of changing refinery capacities, ensuring the alignment of key infrastructure projects, mitigating the impacts of regulatory actions, and improving the state's ability to import products and maintain affordable fuel supplies. While this *Final Report* concludes the formal work of the Task Force, further action will be required to refine and implement its recommendations. The Department of Business, Economic Development and Tourism will continue to work with Task Force members and all stakeholders to promote a smooth transition toward Hawaii's future energy ecosystem.

[1] "Greenhouse Gas Reporting Program: 2012 Data Sets." U.S. Environmental Protection Agency. http://www.epa.gov/ghgreporting/ghgdata/2012data.html

[2] 3 million metric tonnes of reduction by 2020 divided by statewide 2011 GHG emissions reported to EPA of 9.275 million metric tonnes per year is over a 30% reduction.

1. Background and Context

This is the third and final report of the Hawaii Refinery Task Force (HRTF), which was established by Executive Order 13-01 with the purpose of assessing the impacts of changes in Hawaii's refinery capacity and providing advice and recommendations to the Department of Business, Economic Development & Tourism (DBEDT) and Governor Abercrombie on matters involving a future fuels ecosystem.

In recent years, both of Hawaii's two oil refiners—Chevron and Tesoro—have indicated that the performance of their Hawaii refinery assets have been poor and that they might need to consider closure of those facilities. In 2012, Tesoro began searching for a potential buyer and, in early 2013, it announced its intention to close its Kapolei refinery by May 1, 2013.

Initial Task Force Report

In June 2013, the Task Force issued its *Initial Report*, which focused its analysis on the shorter-term impacts of the potential closure of Tesoro's Kapolei refinery on Hawaii markets and the transition to a one refinery scenario. It summarized key findings from the initial meeting of the Hawaii Refinery Task Force, as well as interviews with key stakeholders. The report reviewed Tesoro's transition plan to import product until a buyer could be located for the refinery or its distribution assets, identified likely areas where the transition operation and closure could impact the Hawaii petroleum market, and recommended actions for mitigating the risks of price anomalies and supply disruptions.

Interim Task Force Report

In September 2013, the Tesoro refinery was purchased by Par Petroleum and renamed Hawaii Independent Energy (HIE), operating as a wholly owned subsidiary of Par. With this announcement, the scope of the HRTF's *Interim Report* was refocused to examine the issues which challenge the sustainability of refinery operations in Hawaii, and to consider options to mitigate impacts of the potential loss of one or both refineries.

The *Interim Report*, which was issued in November 2013, examined a range of challenges facing Hawaii's refiners—including reduced profit margins, federal and state regulatory requirements, and decreasing local demand stemming from energy conservation and increased renewable generation—and concluded that one or both of the state's refineries are likely to close by 2020. At the same time, the report found that, despite significant reductions in petroleum product consumption within the power sector, Hawaii will remain heavily dependent on fossil fuels over the coming decade, especially in the transportation sector.

As a result, the *Interim Report* emphasized two sets of actions needed to help maintain the stability of supply and prices moving forward and ensure a smooth transition toward the state's future energy ecosystem: (1) working to resolve several specific regulatory challenges that are having significant impacts on the refineries; and (2) maintaining access to and making improvements to critical fuels infrastructure, particularly the import infrastructure needed to sustain supply with one or both refineries closed.

Final Task Force Report

This *Final Report* builds on the analyses contained within the first two reports to provide recommendations on specific transitional measures through 2020, with a strong focus on the state's infrastructure needs in the event that one or both refineries close. The remainder of this report is organized as follows:

- **Section 2 – Demand for Conventional Fuels.** This section updates the analysis conducted in the *Interim Report* to estimate the reductions in fossil fuel consumption resulting from conservation measures and fuel switching in both the power and transportation sectors, and provides estimates of petroleum demand in 2015 and 2020.
- **Section 3 – Transitional Measures through 2020.** This section details a range of specific measures that the state can pursue to ensure a smooth transition over the next seven years. This discussion is divided into two sub-sections:
    - **Section 3.1 – Fuel Infrastructure.** A range of actions that can be taken to enhance the flexibility of the state's fuel import, storage, and distribution capabilities and infrastructure; and
    - **Section 3.2 – Regulatory Issues.** A discussion of several key regulatory issues and actions that can be pursued to manage short-term impacts on the refineries.
- **Section 4 – Task Force Conclusions and Achievements.** This section summarizes the conclusions of the study and highlights the main accomplishments of the Task Force, making reference to its responsibilities as outlined by the Governor's Executive Order from February 19, 2013.

2. Projected Demand for Conventional Fuels

ICF's *Interim Report* presented estimates of the reduction in demand for conventional fuels in Hawaii resulting from HCEI power sector initiatives (energy efficiency and renewable generation), increased penetration of LNG, and a range of measures in the transportation sector (e.g. CAFE standards, electric vehicle penetration, and biofuels use). This section provides an update of that analysis and summarizes the total impact on Hawaii's conventional fuel demand. ICF's analysis shows that, while the combination of these trends will significantly reduce demand for fossil fuels in the power sector, they are unlikely to create significant reductions in the transportation sector, and the state will remain heavily reliant on fossil fuels through 2020 and beyond.

2.1 HCEI Power Sector Initiatives

The Hawaii Clean Energy Initiative (HCEI) established the state's goals of both reducing electricity demand by 30% by 2030 and increasing the share of renewable energy generation to 40% of net sales by 2030. In August 2013, Governor Neil Abercrombie announced at the Asia Pacific Clean Energy Summit and Expo that Hawaii was committed to going beyond the 40% renewable portfolio standard. These ambitious goals, and the programs and projects implemented to meet them, will profoundly change Hawaii's energy mix and have a significant impact on demand for conventional fuels.

Energy Efficiency

A key driver of reduced energy demand is the state's Energy Efficiency Portfolio Standard (EEPS). The 2009 session of the State Legislature enacted Act 155, codified as HRS § 269-96, which established the EEPS and set a target of 4,300 GWh of electricity use reductions statewide by 2030. According to DBEDT, which proposed the 4,300 GWh figure in legislation, this figure was derived by calculating 30% of the sum of the baseline electricity sales forecasts from the Hawaiian Electric Companies' third Integrated Resource Planning (IRP) processes ("IRP-3") and Kauai Island Utility Cooperative's (KIUC) 2005 IRP, extrapolated to 2030.[3]

The EEPS defined four "performance periods" and established interim goals for electricity reductions during each of these periods. The first performance period is 2009 through 2015, thereby making 2008 the baseline year for purposes of EEPS evaluation, and annual energy savings are allocated in a linear fashion (approximately 195 GWh in reductions each year). Annual targets are shown in Appendix 1 and the interim goals for each performance period are listed in Exhibit 1 below.

[3] PUC Docket No. 2010-0037

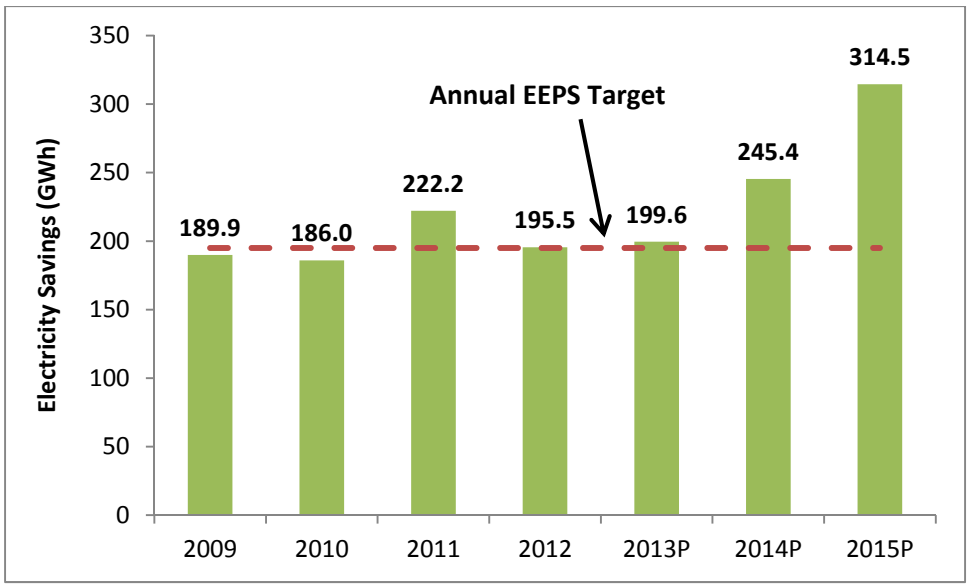
Exhibit 1: EEPS Electricity Reduction Targets, by Performance Period

EEPS Performance Period	Years	New Energy Savings (MWh/year)	Cumulative Energy Savings from Baseline (MWh/year)
First Period	2009-2015	1,375,000	1,375,000
Second Period	2016-2020	975,000	2,350,000
Third Period	2021-2025	975,000	3,325,000
Fourth Period	2026-2030	975,000	4,300,000

Source: PUC Docket No. 2010-0037

In January 2014, the Hawaii Public Utilities Commission (PUC) issued its report to the 2014 Legislature on Hawaii's EEPS. This report found that from 2009-2012, Hawaii achieved a total of 793,600 MWh in savings and that the state is on track to achieve or exceed its savings target for 2015. Exhibit 2 shows the progress that Hawaii has made toward achieving its yearly targets, as well as projections for 2013 through 2015.

Exhibit 2: Annual Energy Efficiency Accomplishments, Statewide



Source: PUC Report to the 2014 Legislature on Hawaii's EEPS, December 2013.

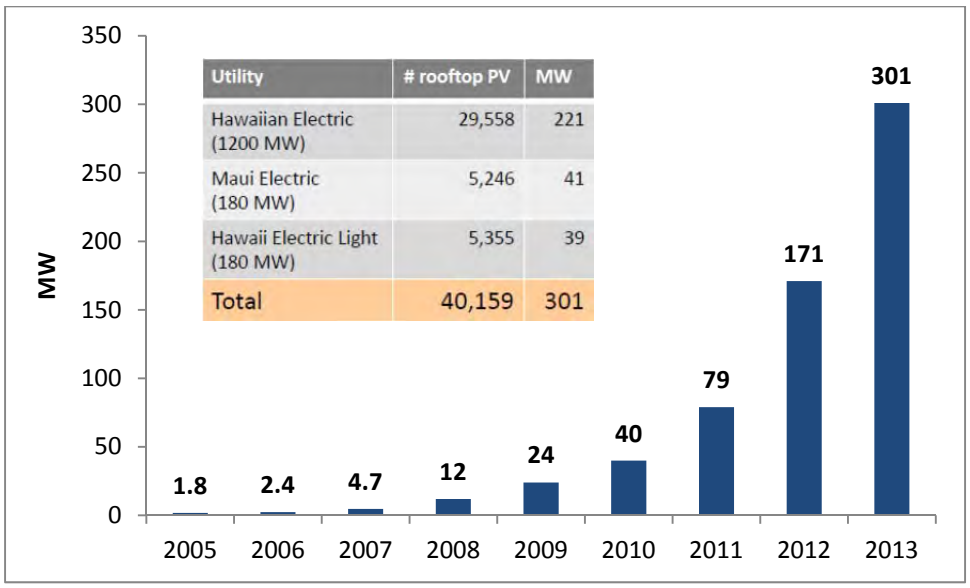
The PUC report draws upon the December 2013 State of Hawaii Energy Efficiency Potential Study which examined the long-term achievability of the EEPS goals and concluded that "it is highly likely that the state's EEPS goals can be met." This study also demonstrated that the state's cost-effective energy efficiency potential significantly exceeds the statutory EEPS goals and that it remains likely that the state will continue to meet its yearly targets.

Given the successful progress to date and the continued optimism of the stakeholders consulted by ICF, it is expected that the state will continue to meet its yearly energy efficiency targets through 2020. This will result in additional electricity reductions of around 581 GWh between 2013 and 2015 (i.e. 1,375 target minus the 794 GWh already achieved through 2012) and an additional 975 GWh by 2020.

Distributed Generation

The most striking renewable energy growth in Hawaii over recent years has been in the area of distributed generation (DG), particularly rooftop solar. Key drivers of this expansion have included high local electricity prices, state and federal tax credits, and declining costs for solar technology. The Hawaiian Electric Companies estimate that 12,215 solar systems were added in their service areas in 2012, exceeding the previous ten years combined. Rooftop solar grew even further in 2013, reaching a total installed capacity of 301 MW, as shown in Exhibit 3 below.

Exhibit 3: Cumulative Installed PV through 2013, Hawaiian Electric Companies (MW)



Utility	# rooftop PV	MW
Hawaiian Electric (1200 MW)	29,558	221
Maui Electric (180 MW)	5,246	41
Hawaii Electric Light (180 MW)	5,355	39
Total	40,159	301

Source: Hawaiian Electric Companies Presentation, February 2014

The estimates of future DG growth presented in the *Interim Report* were derived directly from the IRP's relatively conservative "Stuck in the Middle" scenario. However, based on the recently released figures above which show 2013 installed capacity already well beyond that scenario's projections for 2015, updated estimates were generated for this report. ICF worked with staff at the State Energy Office (SEO) to develop a new set of projections, drawing upon more current data.

While there has been enormous growth in DG over the past four years, more recently the state has seen a significant slowdown in growth, due in part to utility interconnection challenges and delays, and discussions with stakeholders suggest that the explosive growth in DG will continue to taper over the

coming years. Based on recent trends in solar permitting rates, ICF assumed an annual growth rate for distributed generation of 20% through 2015, and 10% from 2016-2020.

Exhibit 4 shows added and cumulative DG through 2020. Building from the 2013 actual figures of DG installed within the Hawaii Electric Companies' service area, and employing a conservative solar efficiency factor of 15% for these systems, ICF estimates that total distributed generation (Hawaii Electric Industries and KIUC) will increase to over 591 GWh by 2015 and to 952 GWh by 2020.

Exhibit 4: Estimated Distributed Generation, Hawaii Electric Companies and KIUC

Year(s)	Added (MWh/year)	Cumulative (MWh/year)
2012 Actual*	-	189,563
2013 Actual**	220,948	410,511
2014-2015 Projected	180,625	591,135
2016-2020 Projected	360,894	952,029
Total by 2020	-	**952,029**

Sources: * From 2012 RPS Status Reports ** Based on HEI Presentation, 2014

For reference, these new estimates are more in line with the IRP's more aggressive "Blazing a Bold Frontier" scenario which projected distributed generation of 1,092 GWh in 2020.

Utility-Scale Renewable Generation

Under Hawaii's Renewable Portfolio Standard (RPS), the state's electric utilities are obligated to meet the following percentages of "renewable electrical energy" sales:

- 10% of net electricity sales by December 31, 2010;
- 15% of net electricity sales by December 31, 2015;
- 25% of net electricity sales by December 31, 2020; and
- 40% of net electricity sales by December 31, 2030.[4]

Hawaii is well on its way to meeting its initial targets, owing to a combination of utility-scale renewable energy projects and widespread distributed generation by utility customers. The Hawaiian Electric Companies achieved 13.9% renewable energy target in 2012 and expected to achieve 18% by the end of 2013, well ahead of the 15% RPS requirement for 2015.[5] KIUC is achieving its renewable generation goals even more rapidly, having achieved 16.7% renewable generation in 2012.[6]

[4] *2013 Integrated Resource Planning Report*, Hawaiian Electric Companies, Revised August 1, 2013 (ES-7)
[5] *2013 Integrated Resource Planning Report*, Hawaiian Electric Companies, Revised August 1, 2013 (ES-7)
[6] KIUC Annual RPS Status Report for the year ending December 31, 2012.

In December 2013, the PUC issued a report to the 2014 Legislature which reviewed the effectiveness and feasibility of Hawaii's RPS going forward. This report found that the 2015 RPS requirement is achievable for both Hawaii Electric Companies and KIUC and, in fact, "The HECO Companies' existing installed renewable resources in 2013 already exceed the 2015 RPS when projected on an annualized basis that considers the full annual energy production expected from installed renewable generation resources." It also found that "it appears likely that the 2020 RPS requirement of 25% is achievable for both the HECO Companies and KIUC, provided that reasonably expected amounts of currently-proposed utility-scale RE projects and distributed renewable generation are successfully developed and integrated on the utility systems."[7]

Moving beyond these broad assessments of the achievability of the state's RPS goals, the ICF team conducted a more granular assessment of likely utility-scale renewable generation projects that are likely to come online by 2020. For the *Interim Report*, ICF compiled a list of renewable generation projects planned in Hawaii which combined: (1) the list of renewable projects in progress presented in Table ES-2 of the 2013 IRP; (2) a list of planned renewable projects in Kauai, maintained by the SEO; and (3) several additional renewable projects recently made public via PUC dockets. For each project, ICF then considered its current stage of development, based on publicly available information, progress in obtaining PUC approval, progress in acquiring site control, and permit status, and consulted with SEO staff and industry stakeholders to categorize it as either "likely to come online by 2015" or "likely to come online by 2020". The full list of projects and notes on methodology are presented in Appendix 2. For this *Final Report*, ICF updated its estimates slightly based on the latest available information on project status.

ICF's analysis of these proposed projects (see Exhibit 5) found that 18 new utility-scale projects are likely to come online between now and 2015, contributing 793,000 MWh/year of renewable generation. From 2016-2020, several new projects are likely to come online—including those resulting from the ongoing 50 MW HELCO geothermal request for proposals (RFP), the Hawaii Bioenergy project, and several hydro projects proposed for Kauai—providing an additional 668,000 MWh/year of renewable power.

[7] Report to the 2014 Legislature on the Public Utilities Commission Review of Hawaii's Renewable Portfolio Standards, December 2013.

Exhibit 5: Likely New Utility-Scale Renewable Generation in Hawaii, through 2020

Likely Time Frame	New RE Generation Added (MWh/year)	Cumulative RE Generation (MWh/year)
Existing RE Projects (2012)	-	1,134,389*
Likely added 2013-2015	793,143	1,927,532
Likely added 2016-2020	668,080	2,595,612
Total	**1,461,223**	

* HECO RPS Status Report for the year ending December 31, 2012.
Sources: State Energy Office Renewable Energy Projects Directory; 2013 Integrated Resource Planning Report (Hawaiian Electric Companies, August 2013); Hawaii Public Utilities Commission Document Management System (DMS); regulatory agency postings and notices; discussions with SEO staff and industry stakeholders.

Given that Hawaii already produced 1,134,389 MWh of utility-scale renewable energy in 2012 (1,093,596 MWh by the Hawaiian Electric Companies and 40,793 MWh by KIUC), these estimates of new projects coming online would bring total renewable energy produced in Hawaii to over 1,900 GWh/year by the end of 2015, and nearly 2,500 GWh/year by the end of 2020.[8]

As noted in Appendix 2, the values above do not include three of the four RFP projects, or the proposed Lanai Wind project, as ICF is uncertain that they will come online by 2020. If those projects were to become operational, they would contribute significantly to the state's total renewable generation capacity. ICF's estimate of 2015 capacity does include the proposed Hu Honua biomass project, which is expected to produce 312,732 MWh/year. Given that this project faces a number of challenges, including permitting issues and pending legislation, there is a possibility that this project will slip beyond the 2015 time frame.

Combined Impacts on Hawaii's Power Sector

Taken together, Hawaii's major initiatives in energy efficiency combined with increasing distributed generation and a pipeline of likely utility-scale renewable generation projects coming online over the next seven years produce a significant impact on the state's power sector. Exhibit 6 shows these cumulative impacts, by sector, for 2015 and 2020.

[8] KIUC and HECO RPS Status Reports for the year ending December 31, 2012.

Exhibit 6: Impact of Energy Efficiency, Distributed Generation, and Renewable Energy

Source	2012 Actual (MWh/year)	Added 2013-2015 (MWh/year)	Cumulative Added 2013-2020 (MWh/year)	Total by 2020 (MWh/year)
Energy Efficiency Savings	793,600	581,400	1,556,400	2,350,000
Distributed Generation	189,563	401,572	762,466	952,029
Utility-Scale Renewables	1,134,389	793,143	1,461,223	2,595,612
Total	**2,117,552**	**1,776,115**	**3,780,089**	**5,897,641**

Source: PUC Docket No. 2010-0037; PUC Report to the 2014 Legislature on Hawaii's EEPS, December 2013; HECO RPS Status Report for the year ending December 31, 2012; KIUC RPS Status Report for the year ending December 31, 2012; State Energy Office Renewable Energy Projects Directory; *2013 Integrated Resource Planning Report*, Hawaiian Electric Companies, August 2013; Hawaii Public Utilities Commission Document Management System (DMS); Regulatory agency postings and notices; ICF Analysis.

By 2020, the State of Hawaii is expected to have reduced electricity demand by 2,350,000 MWh/year and will likely be producing 952,029 MWh/year in customer generated electricity and another 2,595,612 MWh/year in utility-scale renewable generation. The total impact of these trends will be to reduce annual demand for fossil-fuel-based electricity generation by a total of 3,780,089 MWh/year between 2013-2020.

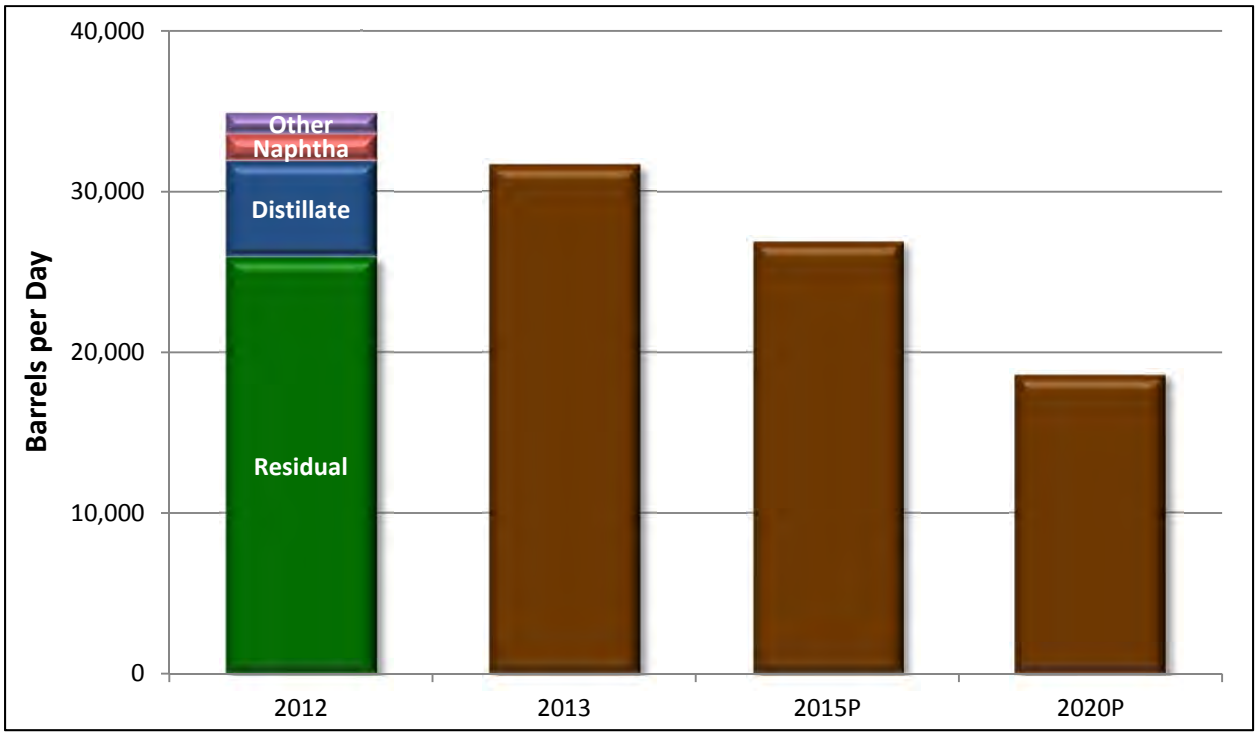
Fossil Fuel Reductions in the Power Sector

More than any other state, Hawaii relies extensively on petroleum products like residual fuel and distillate fuel to meet its power demands. In 2012, the state consumed a total of 34,900 b/d of liquid fuel for power generation; this was comprised predominately of residual fuel (25,900 b/d) and distillate fuel (6,000 b/d). In addition, the state utilizes naphtha for power generation on Kauai and the Big Island and small amounts of other products for power generation in specific applications.

In 2013, based on early released data from EIA, Hawaii consumed a total of 31,700 b/d of liquid fuels for power generation, which is a 9% reduction from the previous year.[9] This sizable reduction is indicative of the impacts that HCEI initiatives are already having on the state's power sector. Looking to the future, the combined effect of the estimated increase in energy efficiency and renewable generation described above will reduce the 2012 demand for petroleum products by 8,600 b/d by 2015 and 18,500 b/d by 2020 (or 53% of actual 2012 consumption by the power sector). Exhibit 7 presents actual liquid fuel consumption for power generation in 2012 and 2013, as well as estimates for 2015 and 2020 based on continued HCEI rollout (the estimates also assume an underlying demand growth of 0.9% per year absent energy efficiency initiatives).

[9] Energy Information Administration, Form EIA-923: http://www.eia.gov/electricity/data/eia923/

Exhibit 7: Liquid Fuel Demand for Power Generation



Sources: *2013 Integrated Resource Planning Report*. Hawaii Electric Companies. June 28, 2013.
Energy Information Administration, Form EIA-923: http://www.eia.gov/electricity/data/eia923/
Hawaii State Energy Office renewable energy projects directory.
ICF Analysis.

2.2 Potential Expansion of LNG

Several companies, utilities, and other entities in the Hawaii market are interested in increasing the supply of liquefied natural gas (LNG) in Hawaii, and there are multiple proposals under development for importing LNG into the state. LNG imports would have a range of impacts on Hawaii's fuel markets, including displacing distillate fuel and residual fuel used for power generation. As is the case on the U.S. mainland, LNG could serve as a complement to renewable generation, as LNG-fueled combined cycle gas turbines (CCGT) are better suited to respond to fluctuations in supply and demand than traditional steam generation.

The Task Force's *Interim Report* discussed a range of issues related to the potential development of LNG in Hawaii, but assumed only a relatively small impact of LNG in Hawaii prior to 2020, based on Hawaii Gas's ISO container initiative. The original intent of this *Final Report* was to reflect a similar limited outlook for LNG prior to 2020, as the state's approach to bulk LNG development would likely not be implemented until after 2020. However, the announcement on March 11, 2014 of the HECO large-scale ISO container RFP could have a significant effect on the refineries well before 2020 and therefore the LNG plans – in particular the HECO RFP – required considerable attention in this *Final Report.* This section of the report summarizes more recent developments in the state related to LNG and raises

several concerns about the potential impacts of LNG imports on refined product demand, grid management, and HCEI implementation.

Summary of Current LNG Initiatives in Hawaii

Hawaii Gas's Limited ISO Container Plan: LNG has the potential to be used as a replacement for the synthetic natural gas (SNG) that Hawaii Gas currently produces and sells to customers throughout Oahu. Presently, Hawaii Gas converts a petroleum product similar to gasoline, called naphtha, into SNG. The naphtha used is either produced by the state's refineries from crude oil or imported directly. On March 6, 2014, Hawaii Gas received approval from the Hawaii PUC to import ISO containers of LNG as a backup fuel, and the initial container was unloaded on April 7, 2014.[10] According to a 2012 Hawaii Gas presentation, Hawaii Gas may begin importing the equivalent of 100 b/d of naphtha in 2014-2015 and, depending on the success of that operation, may expand to 300 b/d by 2016-2018.[11]

Consortium Approach to Bulk Imports: A broader consortium—comprised of the state's major utilities (HECO, Hawaii Gas, etc.) and a combination of public and private entities—is developing a coordinated approach to bulk LNG import infrastructure in the state, involving an LNG terminal facility to receive bulk shipments via LNG tankers or barges for use by all the various parties.[12] Based on discussions with consortium members, bulk importation of LNG is expected to be available by 2021/2022 depending on the timing of permits and environmental review. The gradual implementation of this approach and longer lead time are intended to provide all stakeholders—including the refiners who will be impacted by this initiative—with greater certainty of both policy and timing.

HECO ISO Container RFP: While the consortium approach for the development of bulk LNG imports has been laid out by the state and agreed to by the utilities, HECO recently announced (March 11, 2014) an RFP to purchase up to 800,000 metric tonnes per annum (tpa) of LNG via ISO containers, which has the potential to displace over 18,000 b/d of fuel oil. Delivery under the RFP would commence by mid-2017 at the latest, but will require time to scale up to the full 800,000 tpa as each generating unit will require retrofitting and LNG storage and piping interconnections at additional costs, which have not yet been disclosed. HECO's approach appears intended to serve only its own electric utilities, in which case Independent Power Producers, Kauai Island Utility Cooperative, Hawaii Gas, and marine and ground transportation companies would need to develop their own initiatives. HECO has stated that it views imports via ISO containers as a "near-term solution," however, the RFP requests quotes for delivery of containers for up to 15 years.[13] This would seem to be at cross-purposes with the methodical approach

[10] "Macquarie Infrastructure Company's Hawaii Gas Business Receives Public Utilities Commission Approval on LNG Shipments," Business Wire. March 11, 2014. http://www.businesswire.com/news/home/20140311005377/en/Macquarie-Infrastructure-Company%E2%80%99s-Hawaii-Gas-Business-Receives

[11] *LNG Implementation Planning: A Plan to Serve the State of Hawaii* presentation. The Gas Company/Hawaii Gas, Honolulu, Hawaii, November 29, 2012. Available at http://www.slideshare.net/civilbeat/hawaiigas-lng-presentation

[12] "Appendix 4. LNG Investment Options" of the *Interim Report* provides greater detail on potential bulk import facility options.

[13] "Hawaiian Electric issues Request for Proposals for containerized LNG fuel supply." Hawaiian Electric. March 11, 2014. http://www.hawaiianelectric.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=ec30402830

being developed by the consortium parties to develop bulk supply options by the end of this decade. There is a risk that the interjection of HECO's large-scale container initiative may, even if it is determined to not be economically or technically viable, lead to delayed development of the state's broader bulk delivery approach.

Discussion

The proposed increases in LNG imports to Hawaii raise a number of concerns that should be carefully considered before proceeding, including impacts on refinery sustainability, local delivery infrastructure, and broader power sector objectives. These potential impacts are discussed below.

Impacts on Refinery Closure: The rapid development of a large-scale ISO container initiative will, if successful, accelerate the likelihood of refinery closures as the LNG displaces refinery fuel oil production. As explained in the *Interim Report* regarding the impacts of the federal Mercury and Air Toxic Standards (MATS) requirements, the displacement of residual fuel consumption (in this case, by LNG) would force the refineries to export their residual fuel to other markets, most likely Asia. Not only will the fuel command a lower price in these markets than in Hawaii, but it is costly to transport it there. The displacement of fuel oil in Hawaii would cause substantial losses in refinery revenue.

While both the HCEI initiatives and the consortium approach to bulk LNG imports will reduce demand for refinery fuel oil and other products for power generation, the HECO container initiative is intended to occur almost five years sooner (i.e., 2017 versus 2022) and, at the volumes stated in the RFP, could significantly lower refinery fuel oil and diesel usage in the shorter term. Exhibit 8 shows the potential impact of HECO's proposed 800,000 tpa ISO container initiative on liquid fossil fuel usage within the power sector from 2015 to 2020, assuming that this large-scale ISO option begins in 2017. Given the existing trend of reduced fossil fuel demand in the power sector being driven by HCEI implementation, as described in Section 2.1 above, the introduction of these major volumes of LNG imports would eliminate virtually all demand for petroleum products in the power sector that is still remaining in 2020.

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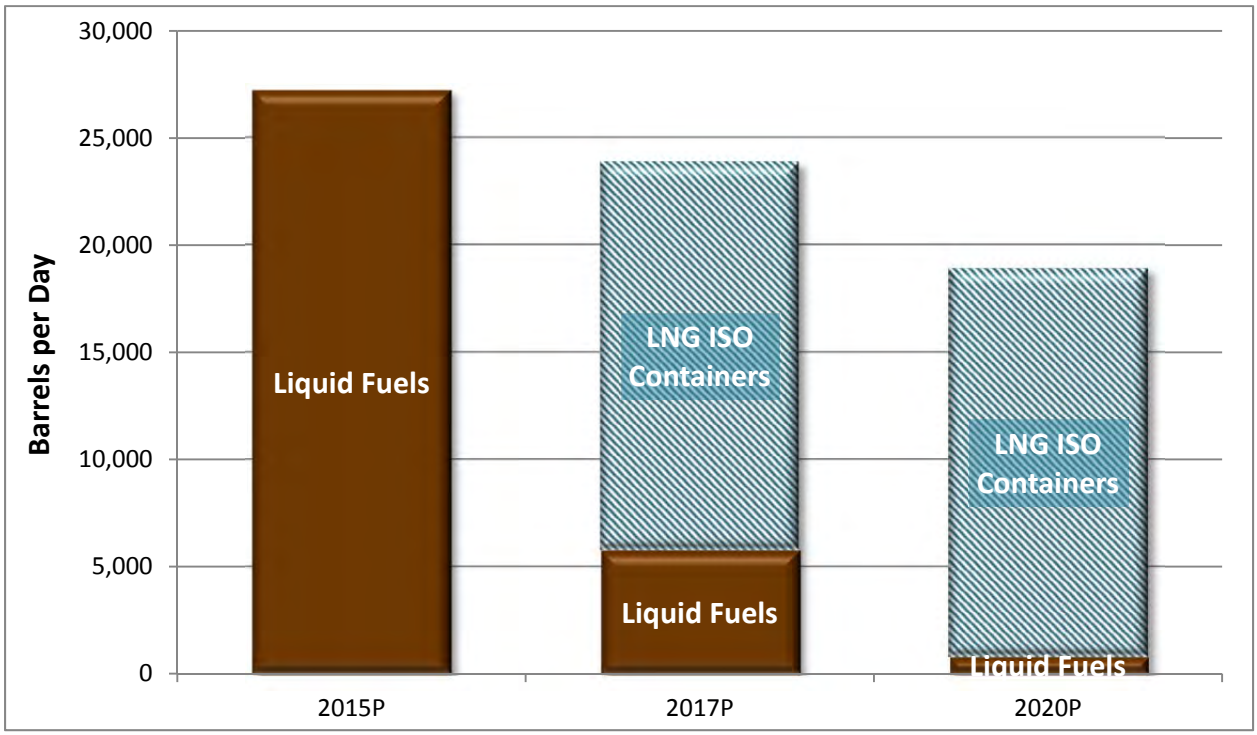
Exhibit 8: Liquid Fuel Demand for Power Generation



Sources: *2013 Integrated Resource Planning Report*. Hawaii Electric Companies. June 28, 2013.
Energy Information Administration, Form EIA-923: http://www.eia.gov/electricity/data/eia923/
Hawaii State Energy Office renewable energy projects directory.
ICF Analysis.

It should also be noted that if EPA favorably decides on HECO's Petition for Reconsideration and Stay of Mercury and Air Toxics Standards, environmental compliance would not be a factor in the decision to choose a quicker deployment path for large-scale LNG.

Impacts on Infrastructure: The success of LNG in Hawaii will not only be dependent on import infrastructure, but will also depend largely on supporting networks that are not currently developed. Under the recent HECO RFP, large-scale ISO container shipments will increase traffic at Hawaiian harbors that are already congested; possibly as many as 1,200 containers per week will be imported. Moreover, the distribution of containerized LNG also needs to be assessed, as there may be significant changes to road traffic and diesel consumption and emissions in the harbor area. These containers will be delivered via truck to generating stations, and this may add a substantial amount of road traffic which should be carefully evaluated for both load and safety.[14]

Impacts on Power Grid and HCEI: Accelerated increases in LNG supply for power generation have implications for both management of the power grid and HCEI implementation. These issues are outside

[14] A forty-foot LNG container loaded with product weighs over 25,000 pounds, not counting the truck weight.

the scope of this study, but are concerns which should be carefully considered in the development of the large-scale ISO container option. Several of these key issues are highlighted below:

- HECO's proposed approach of supplying a large, utility-scale power generation operation via ISO container shipments for an extended basis is unusual and unproven. HECO is not proposing here to use LNG containers exclusively for backup generation; the intention is apparently to use LNG as a primary fuel for base load and dispatchable generation. Additionally, it is unclear how HECO proposes to manage the variability in power demands and intermittency of renewable resources using ISO containers as the predominant source of fuel. Given the critical importance of the state's electricity supply, and the uncertainties and challenges of importing and transporting 1,200 containers per week described above, it would be prudent to study the reliability of such an approach before proceeding.

- Utilizing only ISO containers reduces the potential for establishing any significant storage infrastructure that would be needed to sustain a reliable supply and absorb delays or interruptions caused by any part of the supply chain. Over 1,200 loaded LNG containers would be necessary on-site to have as little as a one-week back up reserve in Hawaii, as compared to almost 40 days reserve of fuel oil inventory at HECO and in the refineries with today's operation. HECO is anticipating using either LSFO or diesel as a backup supply rather than ISO containers, and that may be an alternative if the fuel quality can be maintained in storage. It will be important to be assured of how reserve storage is best managed under the ISO container plan.

- While the gradual and systematic introduction of LNG in Hawaii can help to enable higher levels of renewable penetration by providing needed swing capacity, it is possible that accelerated deployment of substantial volumes of containers of LNG may cause some investors in HCEI related renewable energy initiatives to either delay or reconsider their investments, due to increased uncertainties in the policy environment and the potential impacts on project economics. As such, it is essential to provide transparent, predictable signals to the market on LNG rollout, to maintain an environment that is conducive to ongoing HCEI implementation.

Conclusions: It remains to be seen what role ISO containers of LNG might play in Hawaii's environmental compliance planning; if the EPA favorably rules on HECO's Petition for Reconsideration on the MATS issue, those benefits may prove to be minimal. Additionally, any potential cost benefits to consumers of this approach can only be fully assessed based on the responses to the HECO RFP that are received from potential suppliers. Given the potential nearer term impacts on refinery closure, infrastructure, and the state's broader power sector objectives, the Task Force recommends that the PUC, DBEDT, DOT, and others carefully consider the timing and impacts of the ISO container alternative envisioned by HECO.

Additionally, while the state's plan for a consortium approach to implementing LNG via bulk vessels by 2021-2022 is intended to be carefully planned between all stakeholders, a major increase in LNG imports will present significant challenges for the refineries regardless of the method of deployment.

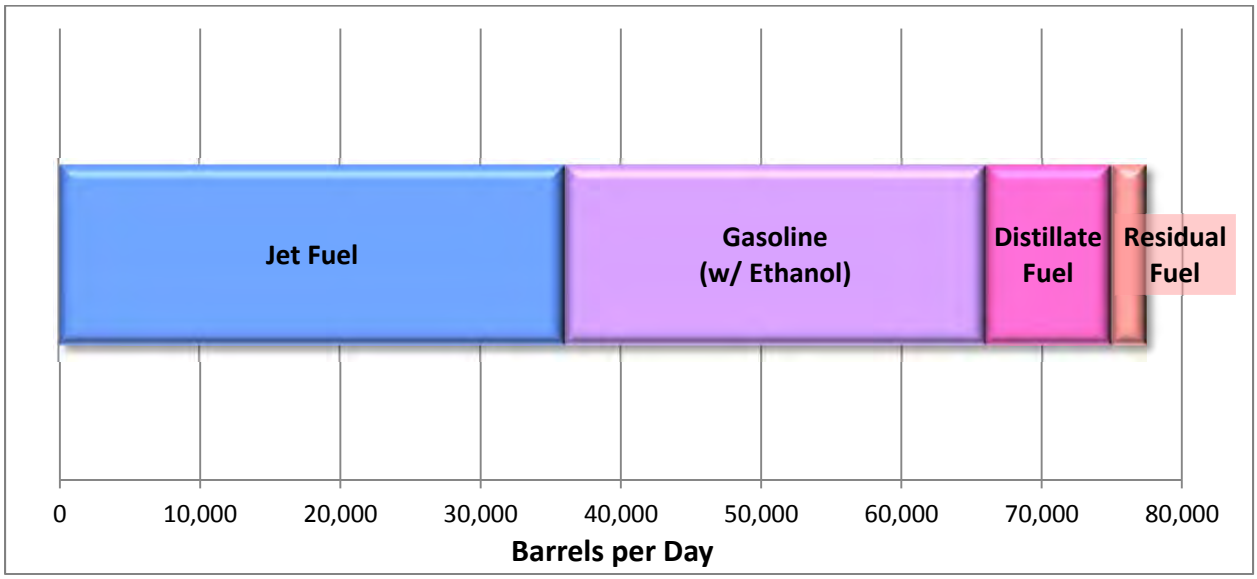
The Task Force believes that the development of large-scale LNG usage in Hawaii should be approached in a careful manner, given the multiple impacts on consumers, the environment, and refineries, as well as the safe and reliable operation of the power grid, harbors, and highways. Much appears to be needed to satisfy these concerns on the proposed large-scale ISO container initiative.

Estimates Adopted in this Report: For the purposes of estimating the likely combined impacts on fossil fuel demand by 2020 contained in Section 2.4 below, this *Final Report* assumes that only the Hawaii Gas initiative for development of limited ISO container imports will be in place by 2020. No larger LNG initiative is assumed to be in place by 2020 for this study due to the numerous uncertainties identified.

2.3 Transportation Sector

In 2012, Hawaii's transportation sector consumed 74,400 b/d of petroleum products; more than twice the amount consumed within the power sector (34,900 b/d). The transportation sector in Hawaii is comprised of a diverse set of parties from road to marine to air transport that consume an array of petroleum-based products. Exhibit 9 presents a summary of the state's consumption of transportation fuels in 2012, and the sub-sections below provide detail on each of the major fuels.

Exhibit 9: Transportation Fuel Consumption, 2012



Source: EIA State Energy Data System: http://www.eia.gov/state/seds/?sid=HI, Hawaii Gasoline Tax Records, and EIIRP. Includes approximately 3,000 b/d of ethanol.

Gasoline

Ground transportation is largely driven by gasoline consumption. Gasoline in Hawaii is typically comprised of at least 90% petroleum derived gasoline and up to 10% ethanol (known as E10). Ethanol is a biofuel that, in the U.S., is typically processed from corn and converted into a fuel for automobiles. Unlike gasoline supply in Hawaii, which may be produced by the Hawaii Independent Energy (HIE) or Chevron refineries or imported into the state, ethanol is essentially all imported from either foreign or

domestic sources. According to EIA, close to 30,000 b/d of E10 gasoline is consumed in Hawaii. Of this, approximately 27,000 b/d (or 90%) is petroleum-based gasoline while 3,000 b/d (or 10%) is ethanol. Gasoline demand represents over 20% of the total petroleum demand in Hawaii.

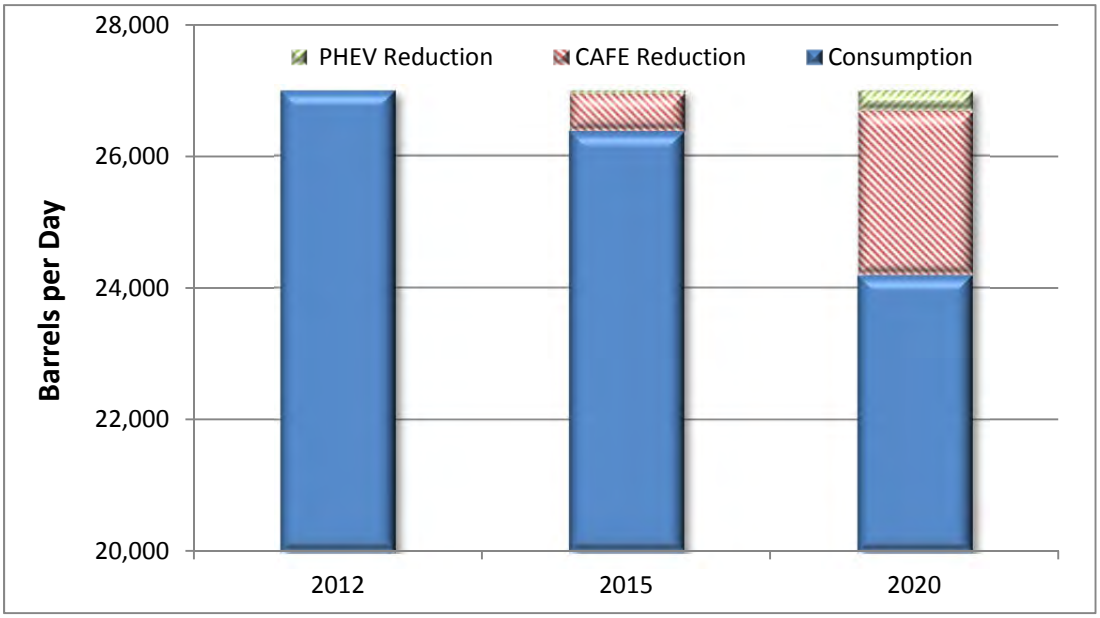
In a step aimed at reducing the nation's dependence on fossil fuels, the Federal Government established Corporate Average Fuel Economy (CAFE) standards, mandating the fuel economy of passenger vehicles. The standards were first enacted in 1975 in response to the Arab Oil Embargo and have been subsequently updated. As noted in the *Interim Report*, the U.S. Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration finalized CAFE standards for cars and light trucks model years 2017 through 2025 in August 2012. These fuel efficiency standards are scheduled to increase steadily and reach 54.5 miles per gallon (mpg) by 2025.[15] Increasing fuel economy while holding other factors constant (i.e. miles driven, vehicle population, etc.) will put downward pressure on gasoline consumption.

In addition to the federal CAFE standards, electric vehicles are also expected to penetrate more of the Hawaii vehicle market in future years. The deployment of PHEVs and other alternative-fueled vehicles will have additional downward pressure on gasoline demand, though the extent of this impact in the future is largely uncertain. This decrease in gasoline consumption will be at least partially offset by increases in the demand for substitute fuels needed to generate the power used by these vehicles (e.g. residual fuel oil for additional electricity generation).

With the continuing evolution of CAFE standards and the outlook for PHEV penetration, it is estimated that gasoline consumption will fall roughly 10% by 2020—from 27,000 b/d in 2012 to 24,200 b/d in 2020—as seen in Exhibit 10.

[15] EPA and NHTSA, "Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards." http://www.epa.gov/otaq/climate/documents/420f12051.pdf

Exhibit 10: Gasoline Consumption and Reduction from CAFE and PHEVs[16]



Sources: *2013 Integrated Resource Planning Report*. Hawaiian Electric Companies. June 28, 2013. Integrated Fuel Plan; EIA State Energy Data System: http://www.eia.gov/state/seds/?sid=HI; Hawaii Liquid Fuel Tax Records; ICF Analysis.
Note: The exhibit uses a minimum of 20,000 b/d in order to highlight the decrease in consumption.

In estimating the impacts from CAFE standards, ICF utilized estimates on vehicle population growth as well as historical turnover rates while holding vehicle miles traveled (VMT) constant over the period. Although not shown in the following exhibit, a proportional decrease in ethanol would follow this reduction in gasoline consumption.

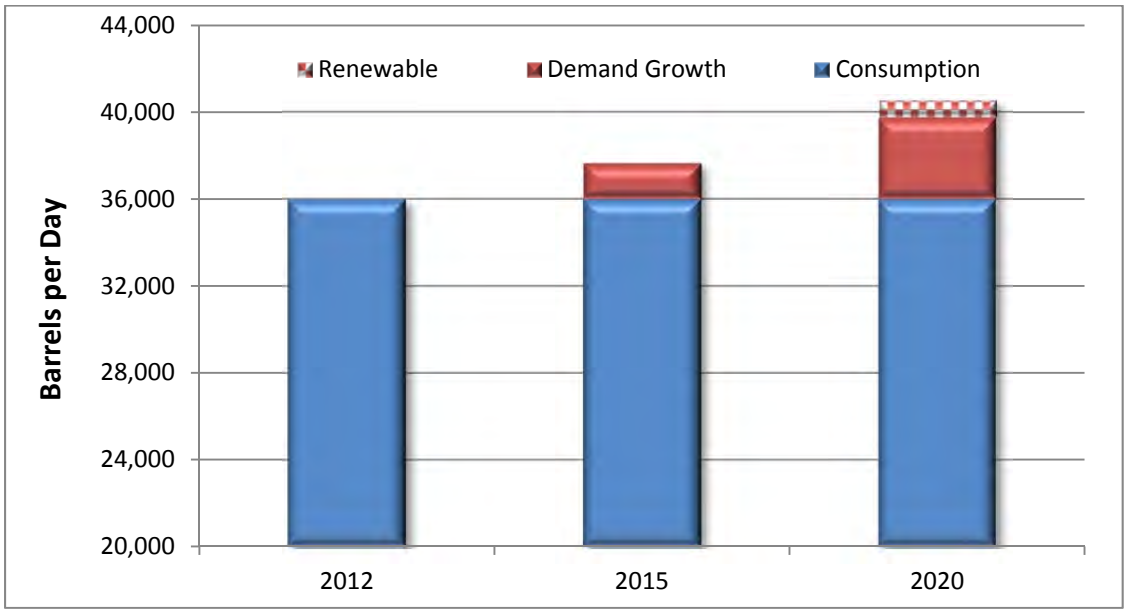
Jet Fuel

At about 36,000 b/d, jet fuel is the most consumed petroleum product in Hawaii. Unlike other products whose demands are expected to remain steady or decrease, jet fuel demand is predicted to increase, due in part to continuing growth in the state's tourism industry. According to DBEDT, the state's jet fuel demand is expected to grow at an annual rate of 1.5% over the coming decades, based on steady growth rates of between 1% and 2% in recent years.[17] By 2020, jet fuel demand is estimated to increase over 12%, reaching over 40,500 b/d. This demand increase is expected to be partially supplied by Hawaii Bioenergy's biofuel plant which is expected to come online by 2020.[18] Among other products, the plant is scheduled to produce renewable jet fuel that will displace roughly 800 b/d of petroleum-based jet

[16] The gasoline displaced in Hawaii by PHEVs will be at least partially offset by an increase in electricity demand. This "PHEV Offset" is not reflected in Exhibit 10, but it is explored in greater detail further on in this section.
[17] *Biofuels Study: Final Report to the Legislature*. State of Hawaii Department of Business, Economic Development & Tourism. December 2012. http://files.hawaii.gov/dbedt/annuals/2012/2012-biofuels-study-act-203.pdf
[18] Hawaii Bioenergy has plans to construct a 22 million gallon per year (mgy) biofuel production facility on Kauai. In October 2013, the PUC approved a supply contract between HECO and Hawaii Bioenergy under which HECO will purchase 10 mgy for 20 years of renewable fuel for its Kahe power plant to displace low sulfur fuel oil. The remaining 12 mgy will be renewable jet fuel to offset the state's high demand for petroleum-based jet fuel.

fuel. Exhibit 11 below shows projected jet fuel demand in Hawaii, along with the offset from Hawaii Bioenergy renewable jet fuel production.

Exhibit 11: Jet Fuel Consumption and Reduction from Renewable Jet Fuel



Sources: EIA State Energy Data System: http://www.eia.gov/state/seds/?sid=HI; ICF Analysis.
Note: The exhibit is set at a minimum of 20,000 b/d in order to better show the increased consumption.

Distillate Fuel Oil

Distillate fuel oil is used throughout Hawaii's economy, particularly for power generation and transportation applications. Within the transportation sector, distillate fuel oil is used for both on-road (cars and trucks) and marine purposes. According to EIA, nearly 16,700 b/d of distillate fuel was consumed in Hawaii, of which over half was used for transportation. Similar to jet fuel, there is potential for future biofuel (i.e., biodiesel) production in Hawaii aimed at offsetting distillate consumption. However, it is not believed that biodiesel will have a significant impact in displacing petroleum-based distillate over the coming decade. It is possible that regulations to displace marine bunker fuels with diesel fuel due to required reductions in sulfur levels in marine fuel oil to 0.1% sulfur by 2015 may slightly increase demand for diesel for transportation in Hawaii at the expense of residual fuel oil.[19]

Residual Fuel Oil

Residual fuel oil is the primary fuel used for power generation in Hawaii. However, residual fuel oil is also used for transportation applications, mainly in the marine industry as bunker fuels. EIA data indicates that about 2,500 b/d of residual fuel was consumed for transportation. This volume may be

[19] The requirement is for any marine transport in defined Emissions Control Areas (ECA's) by 2015 as defined under MARPOL Annex VI of the International maritime Organization. The entire State of Hawaii is one ECA area as defined by MARPOL.

reduced in 2015 and beyond, as the marine industry will be required to use lower sulfur fuels for marine transportation in Emission Control Areas (ECAs), as noted in the distillate section. Any reductions in residual fuel demand for bunker use in 2015 or later will likely have a minimal impact on refinery profitability compared to the programs underway to reduce the use of fossil fuels for power generation.

HCEI Fuel Consumption Goals for the Transportation Sector

The HCEI transportation goal is to reduce the consumption of petroleum in ground transportation by 70% or approximately 385 million gallons per year (mgy) by 2030. HCEI has established transportation and fuels strategies focused on the rapid deployment of electric-drive passenger vehicles (EV), transportation efficiencies, reducing VMT, and the expansion of renewable fuel production. As stated in the *Interim Report* and shown above, Hawaii has achieved very limited progress to date on reducing reliance on fossil fuels in the transportation sector. Much more will need to be done to meet the HCEI's ambitious targets, and additional pathways that go beyond these initial strategies should be considered.

Given Hawaii's continued high dependence on fossil fuels for transportation, and the possibility of transitioning to an import regime in the coming years, it is critical for the state to actively explore alternative options for transportation energy, including passenger vehicles, heavy-duty vehicles, marine vessels, and aviation. To help achieve Hawaii's long-term transportation goals, it is recommended that the HCEI Road Map should be updated to account for the limited progress to date in transportation, and the next phase of HCEI should have an explicit focus on the transportation sector.

2.4 Total Projected Demand

The power sector and the transportation sector account for the vast majority of Hawaii's petroleum demand. The expansion of renewable energy generation, distributed generation, and energy efficiency are expected to have significant impacts on the power sector. The transportation sector is also expected to evolve, though it is not expected to see nearly as much decrease in demand. The impacts from the options discussed above are summarized in Exhibit 12 below. The values shown represent the reduction in demand for the specified products. Note that the 2020 column is a cumulative amount, covering the period 2013–2020.

Exhibit 12: Projected Cumulative Reduction of Fossil Fuel Consumption

	2015P (b/d)	2020P (b/d)	Product(s) Displaced
Power Generation	**8,610**	**18,534**	
Renewable Generation	3,730	7,065	Residual/Distillate/Naphtha
Energy Efficiency	2,830	7,576	Residual/Distillate/Naphtha
Distributed Generation	2,050	3,893	Residual/Distillate/Naphtha
Transportation & Other	**684**	**3,915**	
CAFE Impact (w/ increased vehicles)**	573	2,487	Gasoline (ex. ethanol)
Use of LNG*	100	300	Naphtha
PHEV**	49	311	Gasoline (ex. ethanol)
PHEV Offset***	(38)	(259)	Residual/Distillate
Biodiesel Transport	--	293	Diesel
Hawaii Bioenergy	--	783	Jet Fuel
Total	**9,295**	**22,449**	

*LNG values through 2020 represent only the Hawaii Gas ISO container import initiative.
**Represents the decrease in petroleum-based gasoline and does not reflect decreased ethanol.
***PHEV Offset represents incremental electricity demand from adoption of EVs.
Sources: *2013 Integrated Resource Planning Report*. Hawaii Electric Companies. June 28, 2013; Energy Information Administration; Hawaii Liquid Fuel Tax Records; Hawaii State Energy Office renewable energy projects directory; Hawaiian Electric Company's Energy Cost Adjustment: http://www.hawaiianelectric.com/heco/Residential/Electric-Rates/Energy-Cost-Adjustment; ICF Analysis.

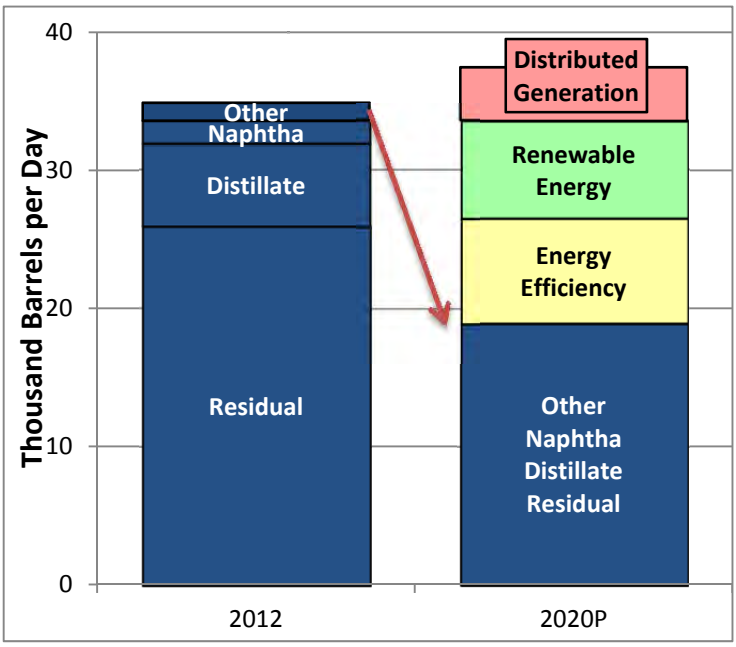
The combination of Hawaii's energy efficiency, distributed generation, and utility-scale renewables initiatives will have significant effects on the power sector, reducing liquid fuel demand by 18,500 b/d by 2020. This represents a reduction of 53% of 2012 liquid fuel demand for electricity generation. The increase in this estimate from the 17,100 b/d shown in the *Interim Report* was driven largely by the accelerated progress seen in distributed generation. By contrast, there will be rather modest effects on the transportation sector—which currently consumes twice the volume of petroleum products of the power sector—with CAFE standards and increased penetration of EV, biodiesel, and other alternative fuels reducing petroleum demand by only 3,600 b/d by 2020, or 4.9% of 2012 demand for fossil fuel-based transportation fuels. Meanwhile, jet fuel demand, which is estimated to grow at 1.5% per year, is expected to outpace these displacements, with demand increasing by 4,500 b/d by 2020.

Exhibit 13 below shows the estimated changes in demand for fossil fuels in 2020, as compared with consumption levels in 2012. The chart on the left shows the changes expected in the power sector, while the chart on the right shows changes expected for the transportation sector and "other" (which includes the use of LNG imported via ISO containers to reduce naphtha consumption by 300 b/d.)

Exhibit 13: Total Impact of Options on Fossil Fuel Demand by 2020[20]

Power Generation

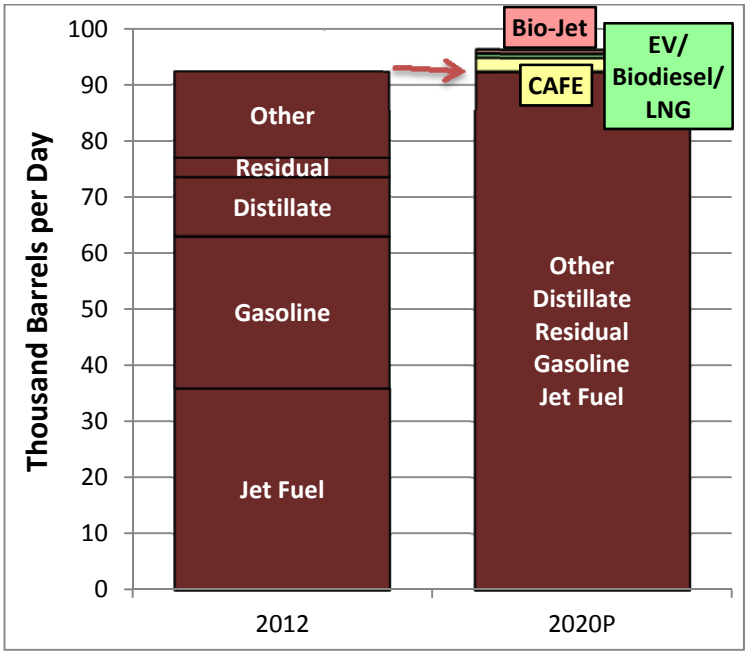
18,500 b/d Reduction (53% of 2012)



Energy Efficiency: –7,600 b/d
Renewable Energy: –7,000 b/d
Distributed Generation: –3,900 b/d

Transportation (ex. Ethanol) & Other

3,900 b/d Reduction (4.2% of 2012)



Transportation: 74,000 b/d
Other (e.g. naphtha): 16,700 b/d

CAFE: –2,500 b/d
Bio-Jet: –800 b/d
EV/Biodiesel/LNG: –600 b/d
Jet Fuel: +4,500 b/d

Sources: *2013 Integrated Resource Planning Report*. Hawaii Electric Companies. June 28, 2013; Energy Information Administration; Hawaii Liquid Fuel Tax Records; Hawaii State Energy Office renewable energy projects directory; Hawaiian Electric Company's Energy Cost Adjustment: http://www.hawaiianelectric.com/heco/Residential/Electric-Rates/Energy-Cost-Adjustment; ICF Analysis.

The power generation sector in Hawaii is poised for a dramatic transition over the coming decade, largely as a result of HCEI initiatives. A mixture of state energy targets and regulations will transform how electricity is produced (renewable and distributed generation) and consumed (energy efficiency) in Hawaii. And the state's rich renewable energy potential provides Hawaii with great opportunities to

[20] 10 mgy of the Hawaii Bioenergy plant's production is reflected in the "Renewable Energy" portion of the exhibit, based on the agreement with HECO, and 12 mgy of renewable jet fuel is reflected in the "Bio-Jet" portion.

source energy locally and reduce dependence on petroleum fuels. Demand falls from almost 35,000 b/d in 2012 to less than 19,000 b/d in 2020.

The transportation and other sectors, meanwhile, are not expected to undergo a dramatic transition by 2020. CAFE standards are expected to have the largest impact but, in total, the trends examined suggest only a modest 3,900 b/d reduction in demand (3,600 b/d due to changes in the transportation sector and 300 b/d due to Hawaii Gas substitution of LNG for naphtha). This reduction, which is more than offset by increasing demand for jet fuel, results in minimal overall changes by 2020.

There are several factors which impede the transformation of the transportation sector. The slow nature of fleet turnover delays the deployment of more efficient vehicles. At present, electric vehicles represent a small portion of Hawaii's overall vehicle fleet and, while these vehicles are expected to achieve tremendous growth rates over the coming decade, they are expected to remain a small part of the market through 2020. Alternative fuels such as CNG, biodiesel, biomass-based fuels, and cellulosic ethanol offer great promise for further reducing fossil fuel consumption, but they will require substantial investment and infrastructure before reaching market maturity. While there are significant challenges in transforming a petroleum-based transportation fuel economy to one built on alternative energy sources, this represents an area of great opportunity for the state moving forward. As such, the state should ensure that the transportation sector is a major focus of the next phase of HCEI and Hawaii's efforts to transform its energy ecosystem.

3. Transitional Measures through 2020

ICF's energy demand analysis, contained in the *Interim Report* and updated in this *Final Report,* concludes that while petroleum-based fuel demands for power generation will be significantly reduced by increased energy efficiency and renewable generation driven by HCEI, Hawaii will remain heavily dependent upon these fuels for transportation and non-power generation needs for the foreseeable future. Given this continued dependency, the potential closure of one or both refineries would create significant pressures on the state's fuel system. If the refineries close, local sources of products would need to be replaced by imports and the infrastructure that is owned/operated by the refiners for importing, storing, and distributing products might become inaccessible, potentially creating disruptions in supply and price.

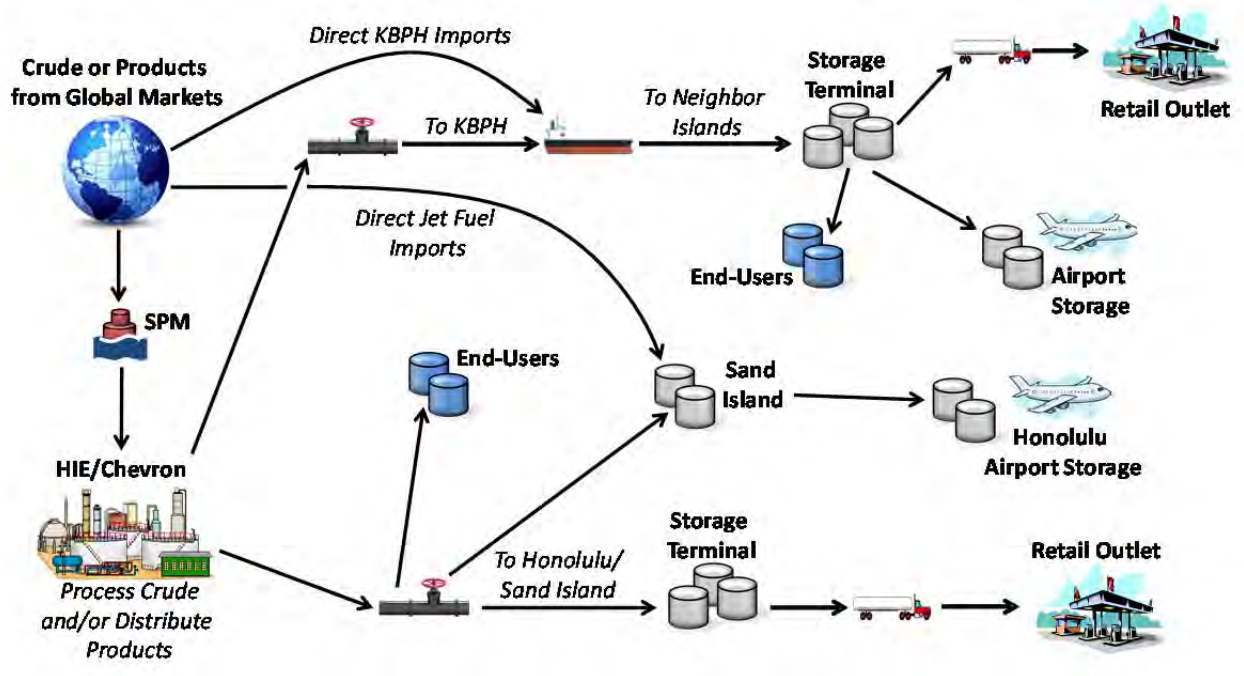
The timing of the closures is also important. Hawaii refiners have typically stated that margins are narrow, and studies have indicated that the refineries are challenged competitively with high crude costs and small scale. Regulatory actions such as federal MATS requirements, Hawaii GHG requirements, and the new EPA Gasoline Sulfur Tier 3 standards could trigger refinery closures at any point in time. Consequently, the need to address possible actions to mitigate refinery closures is an immediate concern, even with both refineries currently operational.

Therefore, based on the likely closure of one or more refineries within the next 5-10 years, it is essential that specific infrastructure and policy issues be in place or planned so that a longer term transition to a new fuel ecosystem can occur in Hawaii, with minimal supply or price disruption to consumers. This section of the report focuses on two sets of actions needed to help maintain the stability of fuel supply and prices during this transition period: (1) measures to enhance the accessibility and flexibility of the state's critical fuel infrastructure; and (2) actions to manage regulatory challenges facing the refiners.

3.1. Enhance Fuel Infrastructure Flexibility

Hawaii's existing fuel supply and distribution system is highly dependent on the operation of the Chevron and Hawaii Independent Energy (HIE) refineries, as well as their associated storage, pipeline and distribution assets, and harbor infrastructure at Barbers Point, Honolulu, and Neighbor Islands. Exhibit 14 presents a highly simplified schematic of this fuel supply infrastructure, noting that the global market can supply either crude or products via the refinery offshore SPMs into the existing refinery storage. Appendix 3 shows a more granular diagram (from the Barge Harbor Task Force Reports) which includes a more detailed Oahu infrastructure and the connections between the refineries and major suppliers and customers.

Exhibit 14: Hawaii Petroleum Supply Infrastructure



Source: Created by ICF, with graphics from:
Globe: http://www.bolgianocapital.com/resources/; Refinery: http://abkldesigns.com/clipart2/indust4.html; Tanker Truck: http://dir.coolclips.com/Industry/Resources/Oil_and_Gas/Petroleum_and_Gas_Transportation/Tanker_truck_indu0425.html; Airplane: http://studentweb.cortland.edu/Jamie.Vacheresse/project%205/5-workscited.html; Service Station: http://www.clipartguide.com/_pages/0511-1003-1600-0715.html; Pipeline Segment and Marine Tanker: http://www.canstockphoto.com/

In the event that one or both refineries close, Hawaii will be exposed to the potential need to import substantial volumes of petroleum products. While the volume and mix of products may change as Hawaii progresses renewable initiatives and LNG over the remainder of the decade, the transition to an import and renewable based energy supply appears inevitable.

Import Operations

During the Tesoro closure period (essentially May 2013 through September 2013), Tesoro sustained operations of the Single Point Mooring (SPM) to import products, utilized refinery storage tanks (including modification of several tanks' service) and pipeline supply to Honolulu and Barbers Point, and supply to Neighbor Islands. This "transition period" provided continuity of supply to consumers with minimal supply disruption, including delivery of products of required quality to consumers such as Kalaeloa Partners (KPLP) and Hawaii Gas via imports. This operation continued until Tesoro completed the sale of the refinery and all assets to Par Petroleum in late September 2013. Despite the Tesoro refinery closure and the extended downtime of the Chevron refinery for maintenance work (in the May-June 2013 period), the refiners worked to import products from other markets and with a few exceptions supply was sustained. While the overall period was only five months, this operation indicated that Hawaii could be supplied on an import basis, assuming that either the existing parties and/or their

successors continue to access and operate refinery storage and distribution networks including the offshore SPMs. The import operation may be able to sustain supply, but it may not fully address impacted parties such as KPLP, which would lose a key revenue stream if the HIE refinery should close and not be able to purchase steam from KPLP.

This section of the report identifies a number of specific actions which the Task Force recommends be addressed to support a reliable import-based transportation fuel supply. This includes several policy considerations so that Hawaii consumers have more assured access to competitively priced products.

3.1.1 Access to Existing Infrastructure

Recommendation: *Ensure continued operation of refinery SPMs, storage tanks and pipelines, even with refineries closed.*

Based on input from HRTF members, the Barbers Point Task Force, and other stakeholders, the ongoing operation of the refinery SPMs, storage assets, and pipeline infrastructures is the top priority of the state to ensure the efficient and sustained supply of fuels in Hawaii following refinery closures. These assets were identified as such in the *Interim Report*. Both refineries have offshore SPMs which can allow receipt and delivery of imported petroleum product into refinery storage, essentially using the import mechanism to "supply" fuels into the Hawaii market in lieu of refining. Products can then be distributed through existing pipeline infrastructure to customers and via the Kalaeloa Barbers Point Harbor (KBPH) to Neighbor Islands.

However, the specific form of the ultimate infrastructure configuration may depend on the strategies of the ultimate buyers of the refiner's distribution assets. For example, Tesoro's interim operation imported jet fuel directly into Honolulu's Pier 51A, and used the refinery SPM only for jet fuel bound for barge loading to Neighbor Islands via KBPH. Tesoro also converted several tanks to provide a more flexible importing process during the transition period, and imported the required product quality for KPLP and Hawaii Gas. However, if a buyer of the Tesoro (now HIE) assets wanted to increase market share in Hawaii by importing more gasoline and diesel, the owner might wish to convert additional tanks to clean products and take other investment steps to increase access to the state market. This is also true if the Chevron refinery closed and sold its SPM and infrastructure to a third party who would operate an import based business supplying Chevron's customers. There are other possible structures for parties who may purchase the assets as well, but there are also risks for parties such as KPLP and Hawaii Gas that they may need to handle fuel or feedstock procurement directly from the market with possible need for some logistics investments depending on the asset owners' interests.

These potential strategies and actions can only be speculated about at this time. While ICF's analysis indicates demand for transportation fuel may only experience modest changes based on current outlooks for alternatives to those fuels, it is very likely that import needs for residual fuel will continue to decline, and diesel and naphtha use for power generation in the Neighbor Islands may also decline as

HCEI initiatives and potentially LNG progress. With lower demands for refinery products and options for new owners to invest in tank conversions and piping, it may be possible to operate the Hawaii petroleum infrastructure with the SPMs, storage, and pipeline assets of only one of the two refiners.

State Vulnerability to Refinery Closure

Task Force members within the petroleum industry have indicated that it is very likely the critical refinery infrastructure would be purchased and operated by third parties should both refineries close. This is because both refiners own assets which can generate profits from the distribution and marketing of petroleum products without the very high costs of operating a refinery and having to invest to meet future environmental regulations at the state or federal level. Nonetheless, the state cannot be certain that the current refiners would continue to operate their assets and businesses (similar to the Tesoro transition process) until a buyer is found.

The single biggest vulnerability which the state faces from the potential closure of the refineries is the absence of an entity to import products through the SPMs, store the products at the refinery tank farms, and distribute product through pipelines to customers. Alternative options include using the Aloha TJM terminal at Barbers Point and the Honolulu terminals and docks to import and then re-ship product to Neighbor Islands, however, these are very limited and both harbors are already very congested. There would also be no option for HECO or KPLP to import residual fuels (or whatever fuel may be required) for power generation, nor Hawaii Gas to import naphtha without using some storage currently owned by HIE or Chevron. Multiple Task Force members have stated that operation of these assets after a refinery closure is critical to sustained Hawaii supply.

The major concern for the state is that the refinery assets are owned by private parties whom the state does not control or regulate. This means that it is possible one or both refiners could opt to close the refineries, sell off their inventory of fuels, and walk away from the assets. This would make it virtually impossible for the remaining fuel suppliers in Hawaii to use the distribution assets (SPMs, refinery storage tanks, pipelines to Honolulu, the Barbers Point harbor, HECO, KPLP, etc.) to import and supply product to consumers.

The likelihood of both Chevron and HIE doing this is very small. If one company were to close and “walk away” from the assets, the other would have a strong opportunity to expand and grow their business, even if the remaining party shuttered refining operations and was operating solely as an importer/marketer. Other parties in Hawaii might also seek to purchase portions of the assets from the party abandoning their assets, and it would be reasonable to assume the assets could be sold. However, there would be great uncertainty of supply during this period for all parties involved in the supply chain, including branded and independent dealers and consumers.

The state's ability to respond to the threat of one or both refineries abandoning their assets is limited. Possible options may include:

1. Work now with both refiners to develop an agreed "exit strategy" which could, as an example, result in an agreement to ensure that the refiner would operate their business as an importing, storage, distribution, and marketing entity for as long as necessary to locate a buyer. The state may be able to explore other means of assistance to refiners to the owner in exchange for this agreement. Much would depend on the owners' perception of their ability to make money in this period operating on an import basis. The State would be open to alternative options suggested by the refiners that would ensure sustained imported supply.
2. If the refining party or parties determine that they cannot operate the necessary assets to sustain imported supplies, then the state will need to consider other alternatives. To ensure public safety and avoid domestic price and supply issues, the state would look at remaining options by law to provide continuity of supply to consumers.

The Task Force recommends that the state consider initiating discussions with both refiners with a goal to increase communications on the refiners' interests, concerns and outlook over the next number of years as regulatory matters and HCEI initiatives continue to impact their business. The refiners may or may not be interested in developing an agreed exit strategy (which is understandable as they have invested a lot in Hawaii and want to remain), however, the state has demonstrated support to sustain the refining business through Hawaii's energy transformation period, and can continue to do so through effective collaboration with the parties.

The ability of the State Energy Office and the DBEDT Director to directly influence the actions of private parties is certainly limited. This is true for the situation described above but it has also been evident that the state's ability to drive even basic policy matters which could influence supply is constrained by Hawaii's governing structure. Other agencies such as DOT, DOH and DOA may not always see the same urgency to implement actions that would help assure sustained supply of fuels to Hawaii consumers in the event of refinery closures. There may be need for establishment of a designated coordinating entity to ensure alignment of policy and actions around conventional fuels, as part of the state's overall energy strategy.

Several of the recommendations in this report require collaboration and cooperation from other agencies to effect changes. Some are long overdue, such as the gasoline specification change; others are still being shaped, such as the approach to GHG emissions management. The serious ramifications of both refineries potentially closing before 2020 requires swift implementation of some of these more immediate recommendations, as well as a collaborative approach to exploring the other more challenging recommendations such as a fuel reserve and Jones Act relief, not to mention undersea cables and LNG import strategy. As such, the state may wish to consider some modified organizational structure which recognizes the importance of moving forward on these critical energy decisions, and which strengthens its ability to resolve matters that straddle the public/private sectors.

3.1.2 Kalaeloa Barbers Point Harbor Planning

Recommendation: *The KBPH study team should continue to work closely with the State Energy Office as the Plan develops, and ensure that propane offloading capacity is included at the Fuel Pier.*

The Kalaeloa Barbers Point Harbor (KBPH), shown in Exhibit 15 below, is currently facing congestion problems and is in need of multiple improvements to handle the range of products and commodities required for Hawaii. In the event that Hawaii is forced to rely exclusively on imports to meet petroleum product demand in the future, the KBPH may become an even more integral part of the state's supply chain and might face significantly more congestion. The KBPH study team, under the Department of Transportation's guidance, is currently examining the trends of these products and recommending actions to meet future demands (e.g., a new fuel pier, harbor dredging, etc.). As part of this process, the team has examined various scenarios for refinery assumptions (operational and closed) as well as demand scenarios.

Exhibit 15: Kalaeloa Barbers Point Harbor

Source: Fuel Pier Development Plan

In order to assess the magnitude of these potential changes, ICF spoke with members of the Department of Transportation's Harbors Division and received data under a Uniform Information Practices Act (UIPA) request pertaining to movements into and out of the harbors in Hawaii. In addition, the KBPH team has shared their new report (in draft form), as well as the Facts Global Energy report on Hawaii's fuel infrastructure. ICF has reviewed the draft report and also examined data from 2013 on KBPH activity in order to assess shipments and cargoes of petroleum products pre-closure (January–April) and post-closure (May–September) to identify the impact the Tesoro closure had on harbor

activity. The latter period also encompassed maintenance at the Chevron refinery (May and June), thus creating a scenario where, for a portion of the time, both refineries were shut down.

Kalaeloa Barbers Point Harbor Study Results

The KBPH study indicates that activity at the harbor is likely to increase from recent history (2012), even with both refineries running, as forecast population growth on Neighbor Islands increases versus Oahu. This drives higher movements to the neighbor islands for transportation fuels. If the refineries close, the study indicates that KBPH imports will increase further.

ICF concurs that imports will increase for products such as naphtha and propane, since the refineries will no longer be producing those products.[21] These increased imports may be somewhat offset by (1) the elimination of unfinished oil movements to and from domestic and foreign locations and (2) reduced demands on Neighbor Islands for distillate and naphtha for power generation due to HCEI initiatives. The net impact on KBPH is not certain due to these multiple variables. However, the KBPH study suggests that the increase in cargoes will be more significant than any reductions, possibly assuming that some percentage of the reduced refinery output will be imported via KBPH and not the refineries' single point moorings (SPMs); this is certainly plausible.

During the Tesoro closure and import period, there was an increase in KBPH volumes imported versus the pre-closure period as seen in the following exhibit. Products moving into KBPH increased from 2,322 b/d to 5,737 b/d largely driven by increased imports of gasoline and asphalt.

Exhibit 16: KBPH Product Imports, b/d

	Pre-Closure (Jan–Apr 2013)	**Post-Closure** (May–Sep 2013)
Gasoline	-	1,216
Diesel	140	683
Jet Fuel	-	47
Fuel Oil	1,840	1,930
Propane	50	503
Asphalt	292	1,357
Total	***2,322***	***5,737***

Source: Department of Transportation, Harbors Division

Although the volume increased substantially, the scale of these volumes indicates that KBPH was not the primary import point, as this volume only represents about 5% of the state's total consumption. Most imports came through the Tesoro SPM or, for jet fuel, Pier 51A. There will normally be an advantage to import through the refinery SPMs due to the ability to offload cargoes directly into refinery storage,

[21] Asphalt imports may increase also, dependent on base level refinery production.

which can access the Honolulu pipelines and terminals as well as the KBPH piers and dependent parties such as HECO, Hawaii Gas, and KPLP directly. KBPH imports would be primarily for specific products such as naphtha, propane, and asphalt, and on occasion gasoline or diesel.

Regardless, there is no dispute that the development of the Fuel Pier at KBPH is essential to meet Hawaii's growing energy needs under all scenarios. In terms of design requirements, it is likely wise for the study team to assume a higher KBPH traffic outlook since the specific makeup of imported cargoes may vary based on future sources and opportunities.

Specific Product Assessment

As noted, while the refineries were down, the majority of gasoline, diesel, and residual fuel were imported through the refineries' SPMs to storage tanks at the refineries. Once in refinery tankage, the supply chain continued as if the refineries were processing crude oil into finished products rather than importing them directly. These products traveled out of the refineries along the existing distribution networks to Honolulu and KBPH. Jet fuel was also imported through the SPMs but Tesoro primarily unloaded cargoes at Pier 51A to expedite the offloading. On occasion jet cargoes partially discharged at the SPM to allow jet to be stored within the refinery and then moved for loading on barges from KBPH to Neighbor Islands.

In the event refineries are closed and one or two of the refinery assets are purchased by a supplier/marketer, there are a significant number of tanks at each refinery which can be modified to manage product imports. Many of the crude oil tanks are floating roof tanks which could hold volatile products such as gasoline and, with some investment for cleaning and piping connections, this additional storage could be used to maximize cargo deliveries into Hawaii (minimizing KBPH import needs). Although the use of the SPMs and refinery infrastructure avoids additional congestion at KBPH, some products that were previously processed from crude oil will now need to be imported through KBPH as noted below.

Propane imports into KBPH increased substantially after the Tesoro shutdown. Only two cargoes were received from January through April, but 23 were received in the May through September period. While the volumes were rather small (the cargoes averaged about 3,000 barrels), the number of vessels further added to harbor congestion. In general, refinery production (with both running) appears to satisfy Oahu propane demands, with only about 170 b/d of propane typically moving from KBPH to Neighbor Islands. Consequently, the loss of production from refinery closures will directly lead to more propane imports into KBPH. Propane imports are received at Pier 1, which can only accommodate barges. This requires propane cargos to offload into barges for delivery into Pier 1. Hawaii Gas has requested that the new Fuel Pier design incorporate the ability to receive propane vessels rather than the barges currently accommodated at Pier 1. This request appears prudent to minimize what may be excessive vessel to barge transfers in the Harbor to manage higher levels of propane imports with one or both refineries closed.

Naphtha imports for Hawaii Gas and/or other naphtha customers (i.e. KIUC) would likely be sourced by imports into KBPH, although both refineries appear to have capability to import naphtha via their SPMs as well. Ethanol is another product that is shipped into and out of KBPH. The ethanol movements are not expected to change if the refineries close. Instead, ethanol movements will be dictated by future gasoline consumption, which is expected to decline steadily over the coming decade, as explained earlier in this report. Lastly, asphalt imports will shift exclusively to KBPH, though asphalt is largely sourced through KBPH imports even when the refineries are operating.

3.1.3 Fuel Reserve

Recommendation: *Consider implementation of a modest fuel reserve (after refinery closures) for selected products.*

In the event of refinery closures and a transition to import-based fuel supply, the Hawaii supply chain will extend a great distance, to either Asian or mainland markets or even further. Hawaii's relatively stable demand levels, combined with sound scheduling of cargoes by the parties operating SPMs, refinery storage, and pipelines, would be expected to provide smooth supply of products. Tesoro's transition operation demonstrated that import based supply can be managed effectively.

In an import model, the refinery SPM and storage would be used to import gasoline blendstock (HIBOB), diesel, some jet fuel (which could subsequently move out via KBPH to Neighbor Islands), and whatever remaining residual fuel requirements are needed for power generation. Given the degree of jet storage at HFFC and declining demands for residual fuel and diesel for power generation over the next decade, the primary fuel reserve concerns would be gasoline and diesel fuel for transportation.

Hawaii may benefit from considering a fuel reserve similar to the one that is being implemented by New York State on Long Island. New York is leasing a 75 thousand barrel (Mbbl) gasoline tank at Northville's terminal in Holtsville, New York. The state is purchasing gasoline blendstock to fill the tank, and the fuel will be managed by Northville to ensure that the fuel is turned over periodically to meet seasonal specifications. New York would release the fuel after catastrophic events, such as Hurricane Sandy, with a focus on supplying first responders and restoration teams. There will also be potential for selling truckloads of gasoline to distributors at the state's discretion.

Assuming both refineries close at some point and the assets are operated by a third party importer/marketer, the state could lease some gasoline or diesel storage capacity from the owner. The state could also lease storage at the Aloha TJM terminal at Barbers Point. Use of some existing tanks would need to be evaluated by the owner, but there should be some surplus storage due to the lack of need for gasoline and diesel component storage after closures. The specific volume of fuel purchased would need to be analyzed based on the intended goal of the reserve. For example, providing a week's supply of gasoline in the reserve would be about 200 Mbbl, a significant amount and likely not realistic

as the cost would be over $25 million to the state plus tank leasing fees. The state would also need to establish the conditions under which gasoline would be released from the reserve. Use of the reserve to address emergencies would be an appropriate goal, whereas use to attempt to control the market if prices are high would interfere with the normal operation of fuel distribution and possibly lead suppliers to reduce their own fuel inventory levels.

Further investigation is warranted by the State of Hawaii to determine the appropriate fuel types, size, placement, and ownership options for any new fuel storage facility or facilities to ensure open and fair access of a diversity of fuel options to various players in the market.

3.1.4 Hawaii Gasoline Specifications

Recommendation: *Enact pending legislation to modify Hawaii's gasoline specifications so that parties importing gasoline into Hawaii will not require unique blends at higher costs.*

House Bill 1938 was introduced on January 21, 2014 by Rep. Chris Lee. The bill stipulates that current standards, as published by the American Society for Testing and Materials (ASTM) and the Society of Automotive Engineers, are adopted for use by the Measurement and Standards Branch of the Department of Agriculture. This means that gasoline fuel standards in Hawaii will adopt ASTM D4814 (2013) and ASTM D5599 (2005) to support oxygenated (E10) fuel in Hawaii. The Bill crossed from the House to the Senate on March 6, 2014.

Adoption of the proposed Bill, or immediate promulgation by the state Department of Agriculture to update the gasoline specifications, would allow Hawaii fuel suppliers to negotiate for imported gasoline volumes without requiring domestic or foreign suppliers to conform to Hawaii's outdated gasoline specifications, which were in place for many years before finished gasoline required blending of 10% ethanol. This limitation, which was inconsistent with the ethanol mandate in Hawaii, had been cited by Task Force members as impacting the ability to secure cost competitive gasoline imports for Hawaii. The legislation appears to be on a path to being enacted, which will help position Hawaii to meet potential gasoline import needs more cost effectively. The Task Force believes that updating the gasoline specifications by rule or statute is important to create fairness in the market place by creating a level playing field.

3.1.5 Pier 51 Prioritization Process

Recommendation: *Implement a prioritization process under the supervision of DOT- Harbors so that Pier 51A can handle 3-4 cargoes of jet fuel per month, in the event that all Oahu jet fuel requirements need to be supplied directly via imports.*

The *Initial Report* and *Interim Report* identified potential bottlenecks at Pier 51A in Honolulu Harbor, based on the increased delivery of jet fuel at the dock in the event of refinery closures. The start-up of HIE mitigated the near-term concern, as the former Tesoro refinery produces substantial volumes of jet

fuel which is delivered into HFFC storage via pipeline. However, demand from the airport still requires at least one cargo per month with both refineries running, and this could increase to 3-4 cargoes with both refineries closed.

The jet cargoes compete with food container vessels from Horizon at Pier 51A, and Horizon typically has priority. The proposed new pier at Kapalama, if approved and funded, will shift Horizon vessels to the new facility, possibly opening up Pier 51A for more jet cargoes. However, it is also possible that Matson may begin to utilize Pier 51A in addition to piers 51B and 51C. The exact development of the harbor options is not clear at this time, however, both food and commodities are critical to Hawaii consumers, as is jet fuel supply to enable tourism and economic growth.

Consequently, it is recommended that DOT–Harbors work with HFFC and the container industry to put in place a process so that, in cases where the outlook for jet fuel inventory could threaten fueling of jets, HFFC would demonstrate the impact based on cargo schedules, and DOT–Harbors would be able to provide jet cargo berthing priority. Similarly if a container vessel was essential for food supply and jet inventory is deemed adequate, a jet cargo may be displaced in favor of a food cargo. In both cases, it is possible that demurrage could be incurred by the delayed vessel, with costs of about $15,000–$20,000 per day (for jet cargoes).

HFFC has agreed to provide operational information on inventories and demands to DOT–Harbors to demonstrate the need for priority of jet fuel cargo discharge as part of a prioritization determination process. It is recommended that affected parties agree to a process so that jet fuel supply and essential commodity supply can be effectively managed regardless of future refinery status or pier development. With population growth anticipated in the state and tourism a critical priority, this process can expedite decisions, improve supply assurance and minimize overall cost of supplies.

3.1.6 Jones Act

Recommendation: *Explore actions to allow Hawaii fuel supply to utilize foreign flag vessels from domestic ports in lieu of Jones Act vessels in order to expand supply sources into the state at more competitive prices.*

The *Interim Report* discussed the possibility to waive the Jones Act requirement to use only U.S. owned and operated vessels to deliver domestic produced fuels to Hawaii. “Several Task Force members have suggested that with the Jones Act waived, Hawaii may have more access to domestic supply as foreign flag vessels are typically much lower cost to charter than Jones Act vessels.” The *Interim Report* concluded that, while it may be true that waiving the Jones Act will increase Hawaii’s access to fuels at lower prices, it is very unlikely that the Jones Act would be waived for this purpose. This *Final Report* revisits this issue since it is a policy matter that could increase Hawaii’s access to fuel at more competitive prices. This would be a very positive factor with one or both refineries closed and Hawaii supply and prices therefore dependent upon access to fuel in a global market.

Jones Act Waiver Process

Jones Act waivers are normally applied for by individual shippers seeking to move a cargo from one domestic port to another, and who find that no Jones Act vessel is available for the shipment. When a shipper identifies the need for a waiver, the shipper must request U.S. Customs and Border Protection (Customs) to use a foreign vessel. Customs then seeks the advice of the U.S. Department of Transportation, Maritime Administration (MARAD) to confirm that no Jones Act vessel would be available for the voyage before making a decision by law (46 U.S.C. § 501). If the waiver is granted, it is normally a one-time only grant.

Hawaii Jones Act Vessel Use

In recent years the petroleum industry in Hawaii has had limited need for Jones Act vessels as part of the supply chain to Hawaii consumers. Virtually all crude deliveries are on foreign flag vessels (North Slope crude oil is rarely processed in Hawaii), and the primary import product, jet fuel, is typically delivered on foreign flag vessels from Asian markets. Both Chevron and Tesoro have used Jones Act vessels in the past to move products (finished and unfinished stocks) back and forth to mainland refineries, but these are normally limited in volume. In recent years, ethanol has been imported into Hawaii from domestic sources on Jones Act vessels. The limited need for Jones Act vessels for product movements into Hawaii is likely to be the norm with both refineries operating.

With one or both refineries closed, Hawaii will need to seek supply from sources thousands of miles away. Domestic sources would include the West Coast (2,500 miles) and the Gulf Coast (6,200 miles), although available product on the West Coast is very limited. For key products like jet fuel and residual fuel which have very low export levels from the U.S. mainland , import sources would likely be Asian markets such as Korea, Singapore, and India, all of which are 5,000 to 10,000 miles away.

Under an import-based fuel supply regime, it will be important for Hawaii suppliers to have access to the broadest market for petroleum products. During the Tesoro transition period, virtually all products imported were foreign, primarily from Asia but also from as far away as Europe. Tesoro indicated that domestic supply was not competitive, in part due to Jones Act restrictions and cost versus foreign flag.

Global market conditions are always in flux and, with the refineries closed, Hawaii suppliers may look to different markets for each needed cargo of fuel. Inability to access the domestic U.S. market—which has been growing significantly and is now exporting almost 2.5 million b/d of gasoline, diesel, and propane (due, in large measure, to stable/declining demands and strong margins for refiners to process price-advantaged domestic light crude)—prevents Hawaii consumers from taking full advantage of the global market, as well as from sharing in the benefits of U.S. shale oil production growth.

As shown in the *Interim Report*, the existing U.S. Jones Act fleet for petroleum is well utilized. New builds are taking place, but most of those have already been chartered. Any planned movements to

Hawaii will require significantly more voyage time than normal coastwise movements, and this could adversely impact the capacity of even an expanded Jones Act fleet.

The need for secure supply of fuels is a key energy assurance issue for Hawaii. Even with the significant reduction in fossil fuels due to HCEI initiatives, Hawaii remains very exposed to imports of transportation petroleum products in the event of refinery closures. The exclusion of the domestic market as a source for these petroleum products increases Hawaii's dependence on foreign sourced products and reduces options to secure competitively priced supply. Ideally, Hawaii could petition U.S. Customs for a blanket waiver to use foreign flag vessels in the event of the closure of one or both refineries, arguing supply security for a strategic national vanguard in the Pacific, consumer benefits from more import flexibility, and lack of Jones Act tonnage to supply Hawaii. A blanket waiver would provide more certainty of policy to shippers who would otherwise need to justify each individual movement through the Jones Act waiver process.

Challenges

The arguments for a Jones Act waiver may be compelling; however, there are considerable challenges which may be difficult to overcome. Hawaii already receives a tremendous amount of critical products using Jones Act vessels, including food, automobiles, consumer goods, etc. The cost of receiving these goods via Jones Act vessels is already borne by Hawaii consumers every day, as evidenced by shelf prices for these goods. So, why should petroleum be treated any differently?

Hawaii may also be criticized because its own policies on greenhouse gas (GHG) emissions clean energy are themselves significant contributors to the threats posed to the sustainability of refinery operations. Critics may question why Hawaii should seek a Jones Act waiver to help secure cheaper and more reliable fuel supply when the state's intention for years has been to eliminate fossil fuel dependence.

Finally, the ability to use foreign flag vessels from domestic ports does not guarantee Hawaii access to fuel at cheaper freight cost. Foreign flag vessel owners may find that Hawaii is a more costly destination to deliver products to, as there would be minimal backhaul opportunities from Hawaii and higher rates may have to be charged.

What differentiates petroleum is that Hawaii already pays much higher prices for energy than the rest of the United States with *minimal* dependence on Jones Act vessels. If access to foreign sources of petroleum products is reduced (e.g., due to Chinese growth, Korean peninsula instability, Asian natural disasters impacting supply sources), Hawaii may need to rely on a significant amount of domestic supply and be exposed to higher freight costs. These costs will directly impact consumers. The State Energy Office is concerned about this exposure and the inability to leverage the huge change in domestic petroleum supplies from shale oil.

Future needs for petroleum imports into Hawaii therefore will not decrease maritime vessel usage or jobs, since minimal Jones Act movements occur with refineries running. Moreover, the ability of ship owners to build new vessels for Hawaii service may be difficult to justify due to the likelihood that Asian prices and foreign flag transport rates may make it difficult for a shipper to contract for long term domestic supply to Hawaii on a Jones Act vessel.

Despite the complexity of this issue and the fact that the approval of a waiver may be unlikely, the Task Force believes that the state should be positioned to prepare a request for a blanket waiver of the Jones Act for a period of time after one or both refineries have closed. This would provide a means of assessing the potential need for the waiver as well as assuring that Hawaii has access to the full global market of fuels in the initial period after closures. It should be noted that some Hawaii legislators are working with colleagues in Guam, Puerto Rico, and Alaska to argue for the elimination of the Jones Act requirement for these states and territories due to the impact of the Jones Act across all commodity costs.[22] Hawaii State Senator Sam Slom states in the article that "it costs about $790 to ship a 40-foot container from Los Angeles to Shanghai, but it costs $8,700 to ship the same container from Los Angeles to Honolulu."

The reliance on Asian markets for petroleum imports may have risks, as noted above, and the state should be prepared to support either a blanket waiver or individual shipper waivers if fuel supply into Hawaii is threatened. The efforts of Hawaii legislators to mitigate the Jones Act requirements will also have a positive impact on Hawaii's ability to import competitively priced fuels with refineries closed.

3.1.7 Energy Assurance Plans

Recommendation: *As part of the regular update and maintenance of Hawaii's Energy Assurance Plan (EAP), ensure that changing conditions such as the refinery closure potential, developing patterns of growing renewable supply and LNG imports, as well as evolving natural and manmade disasters, are addressed.*

Hawaii's EAP, updated in 2013 with federal funding, is a planning tool to enable the state to respond quickly and effectively to energy emergencies through: (1) reducing the risks and vulnerabilities of critical energy infrastructure; (2) enhancing the resiliency of the state's response capability; and (3) increasing the robustness of the state's critical energy infrastructure and operations.

Since the EAP was last updated, Hawaii has increased renewable fuel sources significantly, and now faces a possible shift to an import-based fuels supply should refinery closures occur. Given this possible development, as well as the likely sustained growth in renewable power generation, the Task Force recommends that Hawaii continue to maintain and regularly update the existing EAP. As part of that

[22] "Hawaii, Alaska, Territories Team up on Jones Act." ABC News. March 14, 2014. http://abcnews.go.com/International/wireStory/hawaii-alaska-territories-team-jones-act-22906669

ongoing process, Hawaii should ensure information and content remains current, update plan elements to maximize effectiveness, promote coordination between DBEDT and other stakeholders in the development of the EAP, ensure readiness through training, testing, and exercising, and incorporate lessons learned and best practices.

Hawaii should determine and then document what changes may need to be made as Hawaii's energy supply profile transforms over the next decade. Some possible items are already part of these recommendations (Pier 51A priority, gasoline specifications, fuel reserve, etc.), however, other aspects of the Plan may also need revision over time, including sections on petroleum shortage supply management and waivers to temporarily suspend regulations in an emergency.

3.1.8 Neighbor Island Infrastructure

Hawaii's petroleum infrastructure on the Neighbor Islands is, in many cases, limited and could also be restricting tourism due to jet fuel supply constraints. Industry participants have cited this in conversations as well as in initial statements to the Task Force in April 2013. These physical constraints, as well as constraints related to storage ownership and harbor control, may be valid. However, at this time, those physical constraints are not likely to change due to a refinery closure situation, and therefore these issues are not addressed in this report. Given the fact that these constraints exist, Hawaii may want to examine what could be done to improve access in the Neighbor Islands to more competition and access to fuel, including jet fuel, as a means of both enabling economic growth and more competitive prices.

3.2 Manage Regulatory Issues

As described in the *Interim Report*, there are several specific regulatory issues that present imminent challenges to Hawaii refiners. These issues were cited as having the potential to accelerate the closure of the refineries as they could require substantial changes in the demands for refinery products or the refinery operating yields in order to achieve compliance. The *Interim Report* suggested some options to mitigate or delay the impact of the regulatory issues over the next few years without compromising the goals of the environmental regulations. While several of these issues are driven by federal regulations, the state is working each of these issues to mitigate the potential impacts and timing on the refineries. The *Final Report* discussion focuses on changes since the *Interim Report* and current next steps and recommendations for each of the issues.

3.2.1 Mercury and Air Toxics Standard (MATS)

Recommendation: *Continue analysis of possible blending options and the impact on cost to refiners and consumers, as well as KPLP.*

As detailed in the *Interim Report*, new standards implemented by EPA for non-continental boilers could require HECO boilers currently burning LSFO to adopt other strategies for compliance, including fuels shifting to diesel, fuel blending, or biofuels, retirement, or back-end emissions controls. These standards

are to be implemented by 2015, however, the Hawaii DOH has already approved a one year extension for compliance (through April 2016) and a second year extension may be petitioned to the U.S. EPA.

This is a critical standard for the refiners and Hawaii as it may have substantial impacts on the refineries prior to 2020. The *Interim Report* (Exhibit 8) indicated that, according to the regulation, eight of the ten HECO power plants on Oahu would not meet the new standard. The cost of compliance could range from a substantial (but not fully defined) substitution of diesel fuel for low sulfur fuel oil (LSFO) to the installation of back end scrubbers on the power plants at substantial cost. The cost to refiners could be as great as $200 million annually if it were necessary to displace all LSFO sold to utilities with diesel, and electricity costs to Hawaii consumers could increase by as much as $160 million annually (due to purchase of more expensive diesel fuel and higher volumes of diesel than LSFO).

The *Interim Report* also highlighted that the standards contained in the EPA ruling may have been based on inaccurate test data submitted by HECO. On the basis of these factors, Governor Abercrombie sent a request to EPA Administrator Gina McCarthy on November 10, 2013, requesting that the final EPA ruling for non-continental boilers be reviewed due to the test data issue. EPA has not as yet responded formally to this request. However, on March 20, 2014, officials from EPA Region IX headquarters in San Francisco informed the state that the request is under consideration, although it was not known when a final determination would be made.

In addition, it has been reported that HECO is working with the refiners to determine if there is a suitable blend of diesel fuel and LSFO which could reduce the particulate matter emissions to a level that would meet the existing standard from EPA. Chevron has confirmed these tests are taking place, but neither HECO nor HIE have corroborated that this work is ongoing.

While a blend of diesel and LSFO may mitigate the cost impact to consumers and the refiners, there will still be an estimated loss of about $8 per barrel for LSFO that must be transported to and sold in the Singapore (or other) Asian markets. Moreover, the logistics to achieve compliance may be a challenge. Since diesel supply and demand are balanced in Hawaii, additional diesel needed to meet MATS requirements will need to be imported from other markets. At the same time, the LSFO displaced by the diesel will need to be exported to other markets, since demand for LSFO is declining in Hawaii. Depending on the level of imports and exports needed to develop a blended fuel that will comply with MATS, the existing infrastructure may become constrained.

The need to both (a) store diesel from imports, LSFO, and a blended MATS compliant LSFO, and (b) arrange shipments of LSFO out of Hawaii and diesel into Hawaii could push the limits of storage as well as SPM utilization. If additional imports and exports must occur via KBPH, additional congestion will occur in that area.

Obviously, it is essential that the blending work being done by HECO and the refiners identify the potential blending requirements that will allow compliance with the existing MATS standards so that the

degree of impact can be better assessed. The impact of these blends on KPLP, which is not required to meet the MATS standards because it has a combustion turbine, should also be part of the analysis, as KPLP may need segregated LSFO supply to continue its current operation.

Ideally, the Governor's petition to the EPA will result in an amendment to the non-continental boiler standards to better reflect accurate test results. The Task Force recommends continued analysis of possible blending options and the impact on cost to refiners and consumers, as well as KPLP. The outcome of the EPA appeal may lead to different conclusions if a decision is made to modify the non-continental limits.

3.2.2 Federal Tier 3 Gasoline Specification

Recommendation: *Refiners should work with the state to confirm if they meet EPA criteria for "small refiners" and determine what steps may be needed to meet the specification by either 2017 or 2020.*

The *Interim Report* identified a significant concern that Hawaii refiners will be required to produce gasoline with 10 ppm sulfur by 2017 as part of EPA's proposed Tier 3 gasoline specification ruling. Based on the proposed ruling and the configuration of Hawaii's refineries, the *Interim Report* indicated that this could be a threat to the refineries, in particular Chevron, which has less reported hydrogen treating capacity to remove sulfur.

On March 3, 2014, the EPA finalized the ruling requiring the lower levels of sulfur in gasoline by 2017. However, the EPA included an exemption from meeting the rule until 2020 for refiners who meet the defined category of "small" refiners. The definition of small refiner appears to include any refinery that processed under 75,000 b/d in 2012, however the rule is not explicit as to whether the limit refers to the refinery's calendar day average for the year or whether it cannot exceed this limit on any day in 2012.

Chevron appears to meet this criterion and thus may be granted an exception for compliance until 2020. The HIE refinery believes they will not be granted an exemption and may therefore need to comply by 2017. However, the entire scope of the regulation is over a thousand pages and the very recent ruling may make it difficult for both refiners to be certain of their status without legal and technical review. For the purposes of the Task Force Study, it is assumed that Chevron will be granted an exemption and HIE will not. Therefore HIE would need to comply by 2017 and Chevron by 2020. This assumption delays a costly compliance step for Chevron but does not make it easier for either refinery to actually meet the 10 ppm sulfur requirement. The delay does remove a factor which could have triggered an earlier closure if the 2017 requirement was in place for Chevron. The HIE refinery, even with sound hydroprocessing capability, will need to assess their ability to meet the Tier 3 requirements by 2017.

The Task Force recommends that the refiners communicate with the state to confirm whether they meet EPA criteria for "small refiners" and determine what steps may be needed to meet the Tier 3

requirements by either 2017 or 2020. Given the recent ruling and need for analysis, the state would seek individual meetings with the refiners to discuss their plans by December 1, 2014.

3.2.3 State GHG Reduction Initiative

Recommendation: *Based on current trends and the planned progression of HCEI to further reduce electricity demand while increasing the share of renewable-based generation, Hawaii will likely be able to reduce GHG emissions 30% by 2020. It may be as effective, and less burdensome, to use the HCEI framework to continue to drive emissions reductions, complemented by a rigorous monitoring process. If reductions are not achieved as expected over time, additional rules could then be promulgated by the state to serve as a backstop to HCEI implementation. The Abercrombie Administration should consider the range of stakeholder views on this alternative approach as it makes a final determination of the state GHG rules.*

Draft DOH Rules

The Hawaii State Department of Health's (DOH) initial draft rules set a baseline of 25% reductions of GHG emissions by 2020, based on 2010 emissions numbers for individual facilities. DOH, in response to comments, modified this requirement in November 2013 down to a 16% reduction and provided flexibility for parties to partner to balance requirements. The draft rules require each of the 25 affected large scale emitters to perform a costly and time-consuming "Best Available Control Technology 'BACT'-like" analysis to propose a compliance plan. Under the proposed rules, any parties which have GHG emissions over the required reductions also have the option of partnering with another major emitter that can demonstrate reduced GHG emissions over its designated baseline. Ultimately, decisions to accept or reject the results of the analysis and compliance plans are at the discretion of the Director of the DOH.

Some parties have critiqued the proposed rules and emphasized that the discretionary nature of this approach may cause major polluters to be uncertain of their status until the Director rules on each analytical study and compliance plan. Ultimately, this uncertainty may translate into higher financing costs for the power and refining sectors. Such additional costs could negatively impact the viability of continued local refinery operations and/or would be ultimately passed down to the people of Hawaii in the form of higher electricity rates.

Trends in Hawaii Emissions

As described in the *Interim Report* and in Section 2.4 above, the successful deployment of the Hawaii Clean Energy Initiative and other energy conservation efforts has resulted in major reductions in fossil fuel consumption in the power sector, and it is the primary force in driving reductions in greenhouse gas emissions in the state.

Exhibit 17 below shows the actual statewide GHG emissions reported by all parties in Hawaii to the Federal EPA for 2011 and 2012. These data show a definite progression to lower GHG emissions, with reported emissions from liquid fossil fuel-based power generation declining from 2011 to 2012 by about

452,514 metric tonnes, or a 7.3% reduction. Note that these calculations were made based on actual data by manufacturing entities in Hawaii using the calculation methodologies dictated by EPA under the 2011 GHG reporting rules. These estimates are more accurate than the numbers posed in 1990 as baselines for the state, and the 2011 and 2012 numbers also incorporate all steps taken by Hawaii manufacturing entities since 1990 to improve efficiencies and reduce greenhouse gases.

Exhibit 17: Hawaii Total Reported Direct Emissions, metric tonnes per year

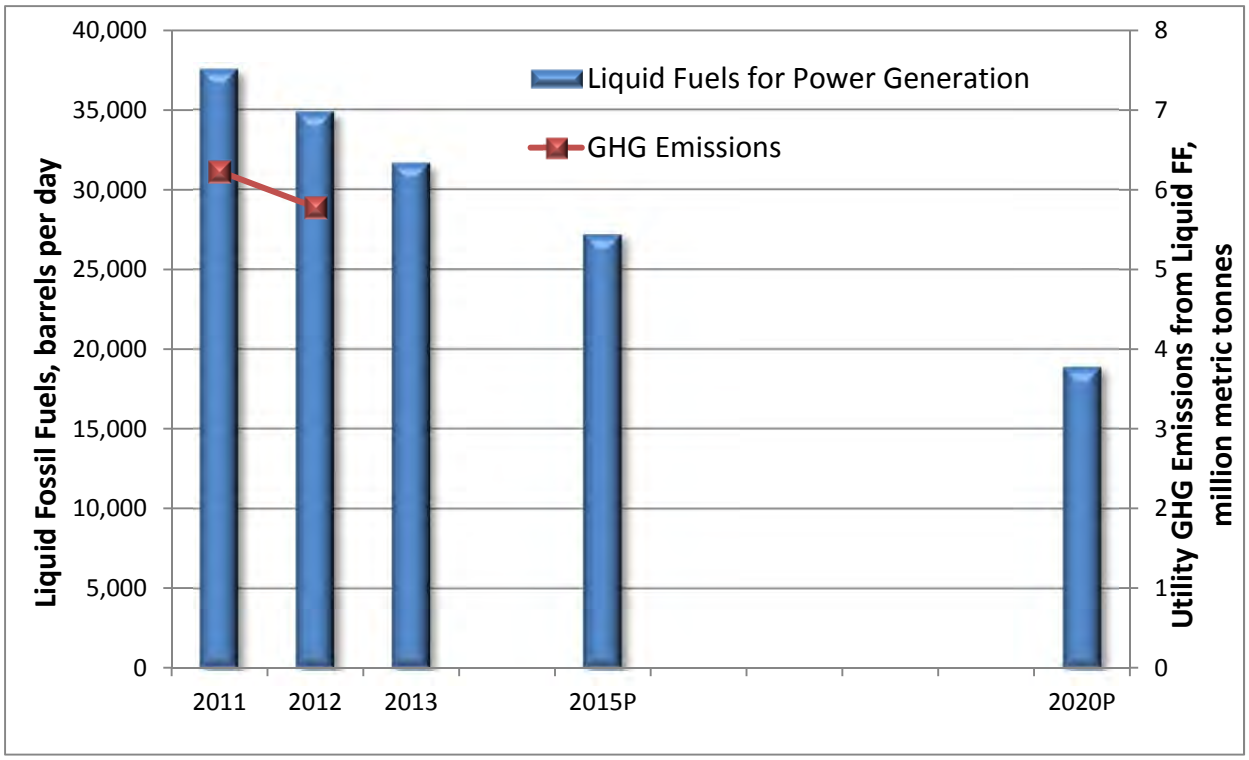
	2011	2012	Change
Total Utility Emissions	7,482,839	7,099,533	(383,306)
AES Coal Fired Emissions	1,250,512	1,319,720	69,208
Net Liquid Fossil Fuel-based Emissions	6,232,327	5,779,813	(452,514)
Refinery Emissions	1,138,266	1,088,946	(49,320)
Other Emissions	646,439	655,246	8,807
State Total	**9,267,544**	**8,843,725**	**(423,819)**

Source: "Greenhouse Gas Reporting Program: 2012 Data Sets." U.S. Environmental Protection Agency. http://www.epa.gov/ghgreporting/ghgdata/2012data.html

Based on current trends and the planned progression of HCEI to further reduce electricity demand while increasing the share of renewable-based generation, Hawaii is expected to reduce its consumption of liquid fossil fuel use for power generation by over 50% between 2012 and 2020. This transformation could eliminate roughly half of the stationary GHG emissions generated from liquid fossil fuel combustion, or about 3 million metric tonnes versus the 5,779,813 metric tonnes emitted in 2012. These power sector reductions could lower total stationary emissions in the state by over 30% from the 2011 levels, even without any contribution from either refinery or coal fired reductions.

Exhibit 18 shows the trend in liquid fossil fuel usage from 2011-2013 in Hawaii and projected usage in 2015 and 2020, alongside reported GHG emissions in 2011 and 2012. As expected, there appears to be a direct relationship between burning fewer fossil fuels and reducing emissions from 2011-2012, and we project that the continued reduction in liquid fossil fuel consumption resulting from HCEI initiatives will further reduce GHG emissions. It would appear that the success of the HCEI initiatives could by 2020 achieve GHG reductions far in excess of those sought by Act 234, as amended, to achieve a 16% reduction from 2010 GHG levels. If HCEI initiatives continue to be successfully implemented, the imposition of specific measures on the refiners or others may be unnecessary beyond what is required to achieve statewide GHG reduction goals and could contribute significant additional costs. Given HCEI's success in driving down fossil fuel consumption, the state's approach to GHG management should account for these major expected reductions.

Exhibit 18: Liquid Fuel for Power Generation and Resulting GHG Emissions



Source: "Greenhouse Gas Reporting Program: 2012 Data Sets." U.S. Environmental Protection Agency. http://www.epa.gov/ghgreporting/ghgdata/2012data.html
Energy Information Administration, Form EIA-923: http://www.eia.gov/electricity/data/eia923/

Alternate Approach to GHG Management

The expected reductions in GHG emissions from HCEI initiatives may suggest an alternative approach to the entire rulemaking process, focused on monitoring the continued progress of HCEI initiatives and liquid fossil fuel reduction. It may be as effective, and less burdensome, to use the HCEI framework to continue to drive emissions reductions, complemented by a rigorous monitoring process. Under this approach, the most critical actions for the state to sustain emissions reductions are to (1) ensure that the HCEI initiatives continue moving forward to achieve the fossil fuel reductions by 2020, and (2) accurately monitor emissions each to ensure alignment of GHG emission reporting with HCEI progress.

Since the state has no guarantee that HCEI targets will continue to be met, emissions data will need to be monitored closely to ensure sustained reductions. Based on the transparency of EPA's new GHG reporting procedures and data reported by power generators to the Energy Information Administration (EIA), it should be relatively simple to monitor fuel use for power generation as well as GHG emissions to verify progress in meeting HCEI and GHG emission goals. If monitoring reveals that GHG reductions are not being achieved as expected over time, additional rules could then be promulgated by the state to serve as a backstop to HCEI implementation.

It should be noted that other parties in Hawaii, including one member of the Hawaii Refinery Task Force, argue that the proposed GHG rules ensure emissions reductions whether HCEI remains successful or not, and that Act 234 allows for GHG reductions that exceed the minimum standard allowed under law. Those parties also emphasize that the proposed rules mitigate the risk of unnecessary measures or additional costs by (i) allowing for Department of Health discretion in implementing any specific measures for the refiners or other parties, and (ii) allowing regulated parties to partner together in achieving GHG reductions.

As it makes a final determination of the state GHG rules, the Abercrombie Administration should seek to reconcile its approach with the projected GHG reductions from HCEI, consider the range of stakeholder views on this subject, and ensure consistency with its response to the federal rulemaking process on existing power plants (i.e., Clean Air Act Section 111d).

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4. Task Force Conclusions and Achievements

The refining industry in Hawaii has served an integral role in supporting many aspects of the state's economy, but faces significant future challenges. The three reports (*Initial Report*, *Interim Report*, and *Final Report*) commissioned with support from DBEDT on behalf of the Task Force have aimed at assessing and highlighting these challenges for the various stakeholders involved in Hawaii's energy future. The *Initial Report* focused on evaluating the impacts of the potential closure of Tesoro's Kapolei refinery on Hawaiian markets and recommended actions for mitigating the risks of price anomalies and supply disruptions. The *Interim Report* expanded upon the *Initial Report* with a focus on the sale of the Tesoro refinery to Par Petroleum and on several challenges to the sustainability of ongoing refinery operations in Hawaii, exploring options to mitigate impacts of the potential loss of one or both refineries. The *Interim Report* concluded that it may be very difficult to sustain profitable refinery operations given the HCEI initiatives and regulatory challenges.

This *Final Report* updates the assessment of fossil fuel reductions resulting from HCEI initiatives, discusses alternatives for importing LNG and their potential impacts, and highlights the status of key regulations impacting the refineries. In addition, this report identifies a number of actions which the state should consider or implement to provide a more robust infrastructure and policy environment so that the Hawaii can be more assured of a steady and competitive supply of fuels in the event that the state must rely exclusively on imported petroleum products. Some of these actions are well underway, including both policy matters such as revisions to the gasoline specification, and infrastructure efforts such as the KBPH planning team's work to provide more capability and less congestion at a critical port for Hawaii's fuel supply chain.

Petroleum product demand for transportation fuels in Hawaii is expected to remain relatively stable through 2020. As a result, the state may need to rely almost exclusively on domestic and foreign sources for transportation fuel supply for a period of time beyond 2020 should the refineries close. While progress on reducing fuel demand in the state's transportation sector has been slow, this represents an area of great opportunity for the state. Hawaii now requires a focused effort to significantly reduce dependence on fossil-based fuels and curb GHG emissions in the transportation sector through a program of policy actions and investments, on a scale similar to the state's successful efforts in the power sector.

Meanwhile, the confluence of HCEI initiatives, diminishing fossil fuel usage for power generation, and possible large-scale LNG imports will require a careful integration assessment to ensure adequate back-up generation capacity and assured power grid management. There are many technical, logistical, and policy issues that must be studied further to ensure a successful transition to an import-based petroleum product economy and the continued transformation of Hawaii's energy ecosystem. The

sustainability of this supply model and the success of this transition will be largely determined by how well the various stakeholders involved can work together.

Hawaii Refinery Task Force Achievements

Executive Order 13-01 established the Hawaii Refinery Task Force with the purpose of assessing the impacts of changes in Hawaii's refinery capacity and providing advice and on matters involving the state's future fuels ecosystem. This final section lists the key directives contained in the Executive Order and comments on the principal achievements of the Task Force in meeting those directives.

- ***The purpose of the Hawaii Refinery Task Force is to assess the impacts to changes in Hawaii's refining capacity and to provide advice and recommendations on matters involving a future fuels ecosystem.*** The Task Force's *Initial Report, Interim Report,* and *Final Report* identify the impacts of changing refinery capacities and provide recommendations to transition carefully to a future fuels ecosystem.

- ***Advise the Governor on specific measures, alternatives and actions that the state should consider in a future fuels ecosystem to maintain adequate and affordable fuel supplies to meet the state's energy needs.*** The Task Force has recommended numerous specific actions, reflected in the Executive Summary and body of this report, to improve the state's ability to import products, ensure alignment of key projects such as the Barge Harbor Fuel Pier and LNG imports with potential refinery closures and HCEI initiatives, and take actions to mitigate the impacts of regulatory actions where either redundant or not properly configured (e.g. MATS).

- ***In addition to the reports required in paragraph 9, short-term findings and recommendations shall be provided to the Governor within 60 days of a refinery closure on the immediate impact and effect of the closure.*** The Task Force provided an *Initial Report* to the Governor within 60 days of the Tesoro refinery closure, with considerable input from Task Force members on the process to transition to an import-based supply, including an assessment on the initial effect of the closure on markets and supply.

- ***Long-term findings and recommendations shall include a plan to prepare for the potential closure of Hawaii's sole remaining refinery by setting a course for Hawaii's energy and fuel future by considering renewable and alternative energies.*** The *Interim Report* assessed in detail the impact of viable HCEI initiatives on renewable generation, energy efficiency and distributed generation, articulating a credible and substantial reduction in demand for liquid fossil fuel use for power generation by 2020.The *Interim Report* also identified the impact of threats to refinery closure from state and federal regulatory actions, and the exposure to sustained requirements for fossil based transportation fuels.

- ***The Task Force shall submit an interim and final written report of its activities and recommendations to the Governor by September 30, 2013 and no later than the last day of the Regular Session of 2014 of the Twenty-Seventh Legislature of the State of Hawaii respectively.*** The Interim Report was published on November 12, 2013 after the timeline was modified to enable an assessment of the impacts of the Tesoro refinery sale to Par Petroleum. The *Final Report* is published herewith.

It is important to note that, while the *Final Report* concludes the formal work of the Task Force, further action will be required to refine and implement its recommendations. The Department of Business, Economic Development and Tourism will continue to work with Task Force members and all stakeholders to promote a smooth transition toward Hawaii's future energy ecosystem, and thanks the entire Task Force for the support, critiques, and recommendations that they have contributed to date as these reports have been developed.

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Appendices

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Appendix 1. Hawaii's Annual Energy Efficiency Targets

Year	GWh Goal	% of Baseline (2008)
First Performance Period		
2009	196.5	1.38
2010	196.5	1.37
2011	196.4	1.37
2012	196.4	1.37
2013	196.4	1.37
2014	196.4	1.37
2015	196.4	1.37
Total	**1,375**	**9.6**
Second Performance Period		
2016	195	1.36
2017	195	1.36
2018	195	1.36
2019	195	1.36
2020	195	1.36
Total	**975**	**6.8**
Third Performance Period		
2021	195	1.36
2022	195	1.36
2023	195	1.36
2024	195	1.36
2025	195	1.36
Total	**975**	**6.8**
Fourth Performance Period		
2026	195	1.36
2027	195	1.36
2028	195	1.36
2029	195	1.36
2030	195	1.36
Total	**975**	**6.8**
Grand Total		
2030	4,300	30%

Source: PUC Docket No. 2010-0037

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Appendix 2. Expected New Utility-Scale Renewable Generation Projects

ICF compiled a list of utility-scale renewable generation projects planned in Hawaii by combining the following sources:

1. The list of Renewable Projects in Progress presented in Table ES-2 of the 2013 IRP;
2. A list of planned renewable projects in Kauai, maintained by the State Energy Office; and
3. Several renewable projects recently made public via PUC dockets.

For each project, ICF then considered its current stage of development, based on publicly available information, progress in obtaining PUC approval, progress in acquiring site control, and permit status, and consulted with SEO staff and industry stakeholders to categorize it as either "likely to come online by 2015" or "likely to come online by 2020." In cases where projects were either unlikely to come online by 2020 or there was insufficient information to make that determination, ICF categorized it as "TBD" and did not include the project's potential generation capacity in the totals of Estimated MWh/year.

Of the 30 projects in ICF's list (see Exhibit 19 below), nine were categorized as TBD, including three of the four HECO "RFP Projects" and the proposed Lanai Wind project.[23] While these projects are significant in scale and have the potential to greatly contribute to the state's renewable generation potential, the complexities associated with the proposed undersea cable and the uncertainty of their timing did not allow us to confidently include them in our estimates of likely renewable generation by 2020. As a result, ICF's estimates of likely renewable generation in 2015 and 2020 are considerably more conservative than those presented in the IRP.

[23] Note that, for simplicity of presentation, in certain cases, bundles of smaller projects whose details are as yet uncertain (e.g. the proposed hydro projects in Kauai) were aggregated into one larger "project" and represented within a single row of the table below.

Exhibit 19: Expected New Utility-Scale Renewable Projects in Hawaii

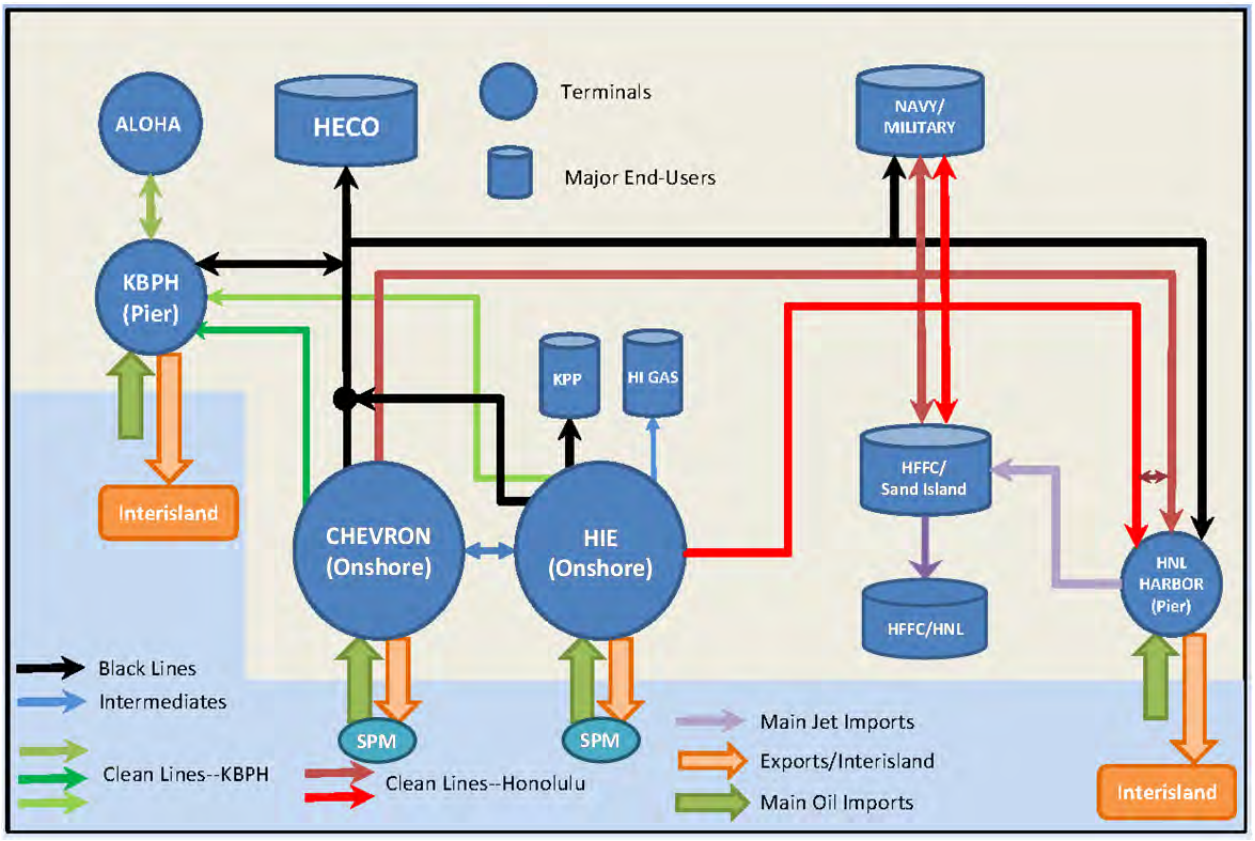
Project Name	Technology	Island	Year Expected	Nameplate Capacity (MW)	Estimated MWh/year	Data Source
Low-Cost Projects 2 (awaiting waiver)*	Solar	Oahu	By 2015	210.0	312,732	PUC Docket No. 2013-0381
Hu Honua Biomass	Biomass	Hawaii	By 2015	21.5	107,000	Hawaiian Electric 2013 IRP
Na Pua Makani Wind Project	Wind	Oahu	By 2015	25.0	88,095	PUC Docket No. 2012-0094
Honua Power	Waste-to-Energy	Oahu	By 2015	6.0	53,000	Hawaiian Electric 2013 IRP
Low-Cost Projects 1 (awaiting waiver)	Solar	Oahu	By 2015	33.0	49,144	Hawaiian Electric 2013 IRP
Green Energy	Biomass	Kauai	By 2015	6.7	47,647	SEO Website
Mililani South PV	Solar	Oahu	By 2015	20.0	27,000	Hawaiian Electric 2013 IRP
15MW HECO PV Project (awaiting waiver)	Solar	Oahu	By 2015	15.0	22,338	PUC Docket No. 2013-0360
Anahola Solar	Solar	Kauai	By 2015	12.0	17,870	SEO Website
KRS2 Solar (Koloa)	Solar	Kauai	By 2015	12.0	17,870	SEO Website
IC Sunshine	Solar	Oahu	By 2015	5.0	7,446	SEO Website
Mountain View PV	Solar	Oahu	By 2015	5.0	7,000	Hawaiian Electric 2013 IRP
Kalaeloa Home Lands Solar	Solar	Oahu	By 2015	5.0	7,000	Hawaiian Electric 2013 IRP
Actus Sunpower	Solar	Oahu	By 2015	5.0	7,000	Hawaiian Electric 2013 IRP
HCDA Projects	Solar	Oahu	By 2015	5.0	7,000	Hawaiian Electric 2013 IRP
Kalaeloa RE Park	Solar	Oahu	By 2015	5.0	7,000	Hawaiian Electric 2013 IRP
Kalaeloa Solar One (CSP)	Solar	Oahu	By 2015	5.0	5,000	Hawaiian Electric 2013 IRP
Honolulu Airport Emergency Gen.	Biofuel	Oahu	By 2015	8.0	3,000	Hawaiian Electric 2013 IRP
RFP Hawaii Island Geothermal	Geothermal	Hawaii	By 2020	50.0	389,000	Hawaiian Electric 2013 IRP
Proposed hydro projects in Kauai **	Hydro	Kauai	By 2020	25.4	106,724	SEO Website
Schofield Generating Station Plant	Biofuel/Fossil	Oahu	By 2020	50.0	44,000	Hawaiian Electric 2013 IRP
Hawaii BioEnergy	Biofuel	Kauai	By 2020	10 MGY	128,356	PUC Docket No. 2011-0369
Cellana Biofuel Project	Biofuel	Maui	TBD	-	TBD	SEO Website
Aina Koa Pono	Biofuel	Hawaii	TBD	-	TBD	PUC Docket No. 2012-0185
Tradewinds Biomass	Biomass	Hawaii	TBD	3.6	TBD	Hawaiian Electric 2013 IRP
Mahinahina Biomass	Biomass	Maui	TBD	4.5	TBD	Hawaiian Electric 2013 IRP
OTEC International	OTEC	Oahu	TBD	100.0	TBD	Hawaiian Electric 2013 IRP
Maui County Waste-to-Energy	Waste-to-Energy	Maui	TBD	TBD	TBD	Hawaiian Electric 2013 IRP
Lanai Wind	Wind	Oahu	TBD	200.0	778,000	Hawaiian Electric 2013 IRP
RFP Oahu non-firm renewable	TBD	Oahu	TBD	200.0	700,000	Hawaiian Electric 2013 IRP
			Total	**1,037.7**	**2,939,223**	

Sources: *2013 Integrated Resource Planning Report*, Hawaiian Electric Companies, Revised August 1, 2013. Hawaii State Energy Office Renewable Energy Projects Directory (https://energy.ehawaii.gov/epd/public/energy-projects-list.html); Hawaii Public Utilities Commission Document Management System (DMS); media outlets; regulatory agency postings and notices; and discussions with SEO staff and industry stakeholders.

*** Oahu Low-Cost Projects 2 (awaiting waiver):** This row represents six new solar projects, totaling 210 MW, that were proposed in a new HECO waiver request submitted November 4, 2013.

****Kauai Hydro Projects:** This row represents a combination of several proposed hydroelectric projects in Kauai. Project capacity and timing for many of these proposed projects is uncertain, however, after discussions with the prospective developers and KIUC, SEO's best estimate of the total potential for these projects is 25.4 MW, or 106,724 MWh/year. While development is not guaranteed, the proposed projects included in these sums are: Kalepa / East Kauai Water Users; Puu Opae; Upper Puu Lua Power Project; Kekaha Menehune; Anahola Water Project; and Olokele River Hydro.

Appendix 3. Oahu Liquid Fuels Infrastructure



Source: Facts Global Energy report for the Fuels Pier Planning Task Force, March 2014.

Note: "SPM" symbols added and other modifications by ICF.