September 25, 2026

Will 100% Renewable Energy on Oahu Ever Be Cost Effective? Highly Unlikely.

A Briefing Paper of the **Practical Policy Institute of Hawaii**

In the debate over switching from oil to LNG for Oahu's power, LNG is framed as a transition fuel to 2045, when Hawaii is assumed to reach 100% renewable energy. We question that assumption--with major implications for how long we should invest in LNG infrastructure.

And LNG opponents frequently cite the estimated $2 billion infrastructure cost as being prohibitive. But they and 100 percent renewable energy proponents have remained silent on defending the capital cost to achieve reliable 100% renewable electricity. If only out of fairness, the capital cost of the two alternatives should be compared side-by-side

The only realistic path to 100% renewable energy on Oahu is solar, combining utility-scale and customer-sited. Community opposition will likely block new wind projects and may block 20-year renewals of existing ones. Hydrogen is too energy-intensive and costly to produce at scale, and imported biofuel would only push the per-kilowatt-hour (kWh) cost to an unacceptable level for ratepayers.

In addition to unacceptable and excessive land requirements, the major problem with relying almost entirely on solar comes down to one word: reliability. Without a thermal source of firm, dispatchable power, what would it cost to run all of Oahu on batteries--every night and on every overcast day? This paper analyzes that cost.

HECo's "hybrid" solar farms are required to provide only four hours of battery storage relative to each farm's peak generation capacity. That storage is typically drawn down during the 5:00 to 9:00 p.m. peak-demand window, then recharged the next day--provided it's sunny. On a cloudy day, a solar farm can't generate enough for daytime demand, let alone recharge for the night. String together multiple cloudy days and the shortfall compounds. Without thermal power on the grid, battery capacity would be needed for both nighttime demand and extended cloudy-day demand.

Readers should understand that battery farms produce nothing--they're a costly middleman between solar farms and ratepayers. Oahu's first such facility, Kapolei Energy Storage (KES), cost roughly $220 million to build. Once KES recovers its capital cost, a rate of return, and throughput charges, HECo estimates a 20-year cost to ratepayers of $500 million. But KES's 565 megawatt-hours of storage covers less than 3% of Oahu's daily demand.

That raises a critical question in calculating the true cost of reliable solar power: how many days of battery backup should be required? How much risk should we accept that overcast days could leave the island dark? The March 2026 Kona Low storms--nearly two weeks of overcast skies--bring this point into sharp focus.

Moving from the 20 to 30 days of energy security historically held in oil storage, and assuming that 70% of Oahu's electricity might come from solar, the Practical Policy Institute (PPIH) believes that depending on batteries to back up this level of demand for fewer than five days of would be unwise.

The next critical assumption is the future cost of batteries. Advocates for 100% renewables argue that battery costs will likely fall in the future. But rather than a vague supposition, what's a realistic low-cost

projection? KES's capital cost was $389 per kWh of storage. The National Renewable Energy Laboratory projects a lowest-cost estimate (vs. mid or high) of $147 per kWh by 2035; to provide an optimistic "best case" scenario, PPIH used this estimate in its calculation--62% below KES's actual cost.

Based on these assumptions, Attachment A provides a calculation of the capital cost of battery backup at the projected 2045 demand level: **a staggering $13.5 billion**. Skeptics can subtract $1.9 billion for each day less than five days of reliability assurance.

Doubling that capital cost over 20 years, to cover cost recovery, rate of return, and throughput charges, yields an annual ratepayer charge of $1.35 billion. At projected 2045 demand--net of customer-sited solar--that's an **additional** $0.15 per kWh charged to all HECo ratepayers who don't generate their own power.

The inescapable conclusion: Massive battery farms sized to guarantee solar reliability are cost-prohibitive. But isn't 100% renewable energy **required** by Act 97 of 2015? Perhaps a surprise to many, the answer is clearly **no.** The supposed "mandate" contains 13 exceptions for circumstances "beyond an electric utility company's reasonable control," including #9: "inability to acquire sufficient cost effective renewable electrical energy."

It is PPIH's view that "cost effective renewable electrical energy" should be read to include reliable electricity. HECo is currently soliciting bids for new utility solar farms; the most recent, Mahi Solar, came in at $0.23 per kWh. With the loss of federal subsidies, plus the impending phaseout of Hawaii subsidies, that number will likely increase in the future. Add the $0.15 reliability cost factor above, and the total cost of backed-up solar generation may well exceed $0.38 per kWh (before distribution and administrative costs)--well above new and more efficient natural gas co-generation.

PPIH also believes Oahu will need thermal power beyond 2045, not only as solar backup but to meet a substantial share of demand outright. The Institute's Briefing Paper #7 (Attachment B) projects that solar--utility and customer-sited combined--will "hit the wall" on Oahu at about 45% of total demand (solar accounted for 25% of 2025 demand), due to (1) land constraints (the Institute considers committing more than 8,000 acres to utility solar farms imprudent) and (2) single-family rooftop saturation (unlikely to exceed 75% of all rooftops).

That implies a continuing need for thermal generation after 2045, potentially for as much as 50% of demand, as depicted in Attachment B and discussed in the footnotes. Natural gas, shipped to Hawaii in the form of LNG, is the only practical alternative to reduce the cost of electricity to ratepayers, reduce CO2 emissions relative to burning oil, and ensure that power is available at night and on cloudy days.

We should absolutely continue to use our best efforts to achieve 100% renewable, but should these efforts fall short, having in place the infrastructure utilizing the lowest cost fuel is the most practical pathway ahead for Oahu's ratepayers. We should all support the LNG initiative laid out by Gov. Green and the Hawaii State Energy Office.

Projected Capital Cost of Battery Backup for Overcast Days

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Calculation step	Value
Projected 2045 annual electricity demand for Oahu[1]	12,000 GWh
Assume 70% of power generation is solar	× 0.70
Equals annual solar generation	**8,400 GWh**
Divided by 365 days	÷ 365
Equals daily solar generation	**23,000 MWh/day**
On overcast days, assume 80% sun occlusion	× 0.80
Equals daily backup needed	**18,400 MWh/day**
Assume five days of backup for reliability	× 5 days
Equals total battery capacity needed	**92,000 MWh**
Times projected cost per kWh installed[2]	× $147
Equals capital cost for battery backup[3]	**$13.5 billion**

Notes and Sources

(1) Hawaii Climate Change Mitigation and Adaptation Commission, Hawaii Climate Action Pathways, 2025.

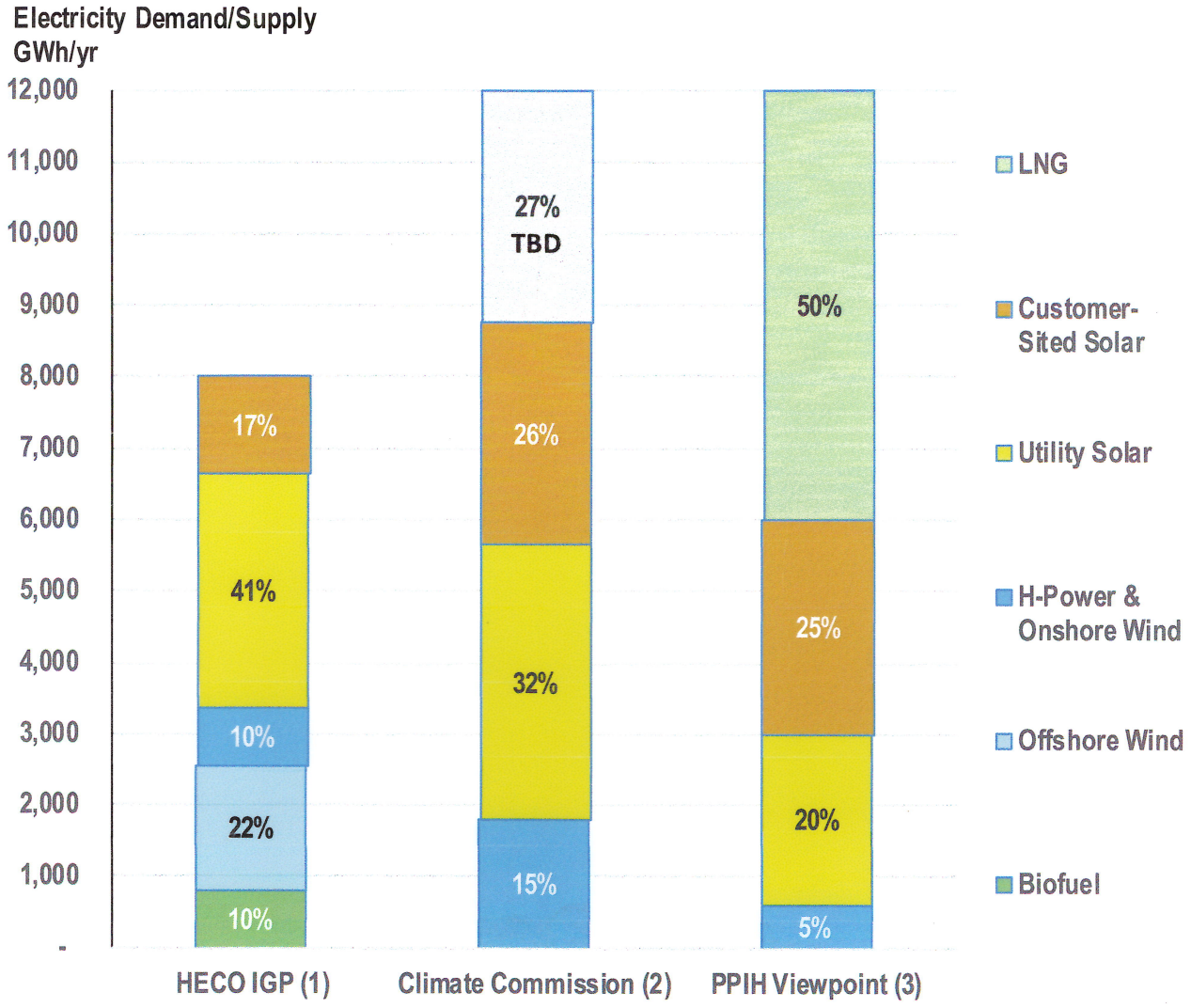
(2) Assumption based on the low range (vs. mid or high) of National Renewable Energy Laboratory projections (2025 update) for 2035. The cost assumed is intended to show the best-possible case, which PPIH views as unlikely given Hawaii's unique situation: high land cost, shipping, higher pricing for provider risk, etc.

(3) Ratepayers will likely be repaying at least double the capital cost, as the battery farm provider is entitled to recover capital cost, a rate of return, and throughput charges. HECo's estimated cost to ratepayers for the $220 million Kapolei Energy System battery farm is $500 million over 20 years. Doubling the above capital cost and dividing by 20 years results in **a charge to ratepayers of $1.35 billion per year**, which is additive to solar farm generation cost. At the projected 2045 energy demand level above, net of assumed customer-sited solar generation, this equates to $0.15 per kWh chargeable to all ratepayers.

It is also important to note that battery farm batteries will likely have to be replaced after 20 years, vs. thermal plant infrastructure life well in excess of 30 years.

Updated September 24, 2026

Oahu 2045 Electrical Energy Sources: Three Viewpoints



1. Demand level and source-of-power percentages from Hawaiian Electric's Integrated Grid Plan (IGP) Preferred Plans and Next Steps, November, 2023.
2. Demand level and source-of power percentages from the Hawaii Climate Commission's "Hawaii Climate Action Pathways 2025."
3. Viewpoint of the Practical Policy Institute of Hawaii (PPIH). Comments on the various power sources:
    a. Onshore Wind: The PPIH view is that existing onshore wind projects on or near the North Shore will be at or after their useful lives and that community pushback will negate any new or replacement wind projects.
    b. Utility Solar Farms: The PPIH view is that both the IGP and Commission projections would necessitate imprudent land use, requiring more than 13,000 acres of land and be in conflict with other land-use priorities.
    c. Customer-sited Solar: the PPIH view is that the IGP isn't sufficiently optimistic, and that there will be continuing solar growth in residential rooftops, retail/industrial parking lots, and on military lands.
    d. LNG: The aggregate of the Commission's 27% TBD projection plus incremental reductions in onshore wind and utility solar farm projections as discussed above.