

1-31-2019

## Reform Incentives, Transform the Grid: Making Good on Hawai‘i’s Renewable Energy Ambitions

Tyler McNish

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Tyler McNish, *Reform Incentives, Transform the Grid: Making Good on Hawai‘i’s Renewable Energy Ambitions*, 45 *ECOLOGY L. Q.* 583 (2019).

### Link to publisher version (DOI)

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# Reform Incentives, Transform the Grid: Making Good on Hawai‘i’s Renewable Energy Ambitions

Tyler McNish\*

*In 2008, Hawai‘i’s electric utilities and state government committed to transforming Hawai‘i into a world leader in the adoption of renewable energy. The characteristics of Hawai‘i’s electricity system—including high imported fossil fuel costs—appeared to make this project more technically feasible, economically attractive, and politically popular in Hawai‘i than in any other state. And yet, a decade later, Hawai‘i’s electricity grids remain less renewable than those of many mainland states (such as California), and continue to emit 35 percent more carbon per kilowatt-hour than the U.S. average. Why? In this Article, I trace the disappointments of the last decade to incentives problems endemic to Hawai‘i’s electricity law. Specifically, Hawai‘i’s attempt to hybridize the traditional vertically integrated utility model with pro-competition policies encourages independent power producers to take the lead in developing transformative renewable projects, but leaves them reliant on traditionally regulated utilities with an incentive to favor utility-owned projects. In the resulting stalemate, both utilities and independent power producers propose transformative projects, but neither has the power to bring those projects to completion. The options for improving incentives in Hawai‘i’s electricity sector fall into three categories: (1) performance-based ratemaking; (2) industry restructuring; and (3) cooperatization or municipalization. I conclude that performance-based ratemaking, wheeling-based restructuring, and ISO-based restructuring are unlikely to furnish a sound framework for Hawai‘i’s electricity sector. By contrast, a simpler generation divestiture reform based on the TransCo model of restructuring has potential, as do governance changes like cooperatization or municipalization. By clearing out the unnecessary incentives*

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DOI: <https://doi.org/10.15779/Z384B2X52K>

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\* Between 2012 and 2017, the author represented renewable energy clients in Hawai‘i, and participated in many of the proceedings discussed in this Article. The opinions expressed in this Article, however, are the author’s alone, and should not be attributed to his former clients, colleagues, or business partners.

*conflicts that have hampered progress over the last decade, these policies could allow Hawai‘i to make good on its renewable energy ambitions over the next decade.*

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## INTRODUCTION

In 2008, the state of Hawai‘i signed a memorandum of understanding with the federal Department of Energy.<sup>1</sup> The memorandum committed the two governments to working together on the “substantive transformation of the financial, regulatory, legal, and institutional systems that govern energy planning and delivery within the State,” in order to “make the state a global model for achieving a sustainable, clean, flexible, and economically vibrant energy future.”<sup>2</sup> Later that same year, Hawai‘i’s governor, several state executive officials, and CEOs representing all of the state’s investor-owned utilities executed an agreement articulating a similar vision: “On behalf of the people of Hawaii, we believe that the future of Hawaii requires that we move decisively and irreversibly away from imported fossil fuel for electricity . . . and towards indigenously produced renewable energy and an ethic of energy efficiency.”<sup>3</sup> The agreement set out a number of concrete steps that the utilities and state would take toward making good on its vision, including the integration of up to 400 megawatts (MW) of wind power into the O‘ahu system via undersea cable, the addition of a further 235 MW of renewable power from projects already under development, the opening of competitive bidding proceedings for further renewable generation, and the substitution of biofuels for petroleum at the utilities’ traditional fossil fuel plants.<sup>4</sup> They also agreed that Hawai‘i’s Renewable Portfolio Standard goals should be strengthened to require Hawai‘i’s electric utilities to make renewable generation 40 percent of their electricity sales by 2030—making Hawai‘i’s targets among the most ambitious yet promulgated by any state.<sup>5</sup>

This consensus reflected special circumstances that appeared to make a transformative move towards renewables more feasible in Hawai‘i than in any other U.S. state. Hawai‘i relies to an usual extent on expensive petroleum products, and consequently suffers from electricity prices two to three times the national average.<sup>6</sup> At the same time, it enjoys abundant wind, solar, geothermal,

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1. Memorandum of Understanding Between the State of Hawaii and the U.S. Department of Energy, Oct. 2008, [http://research3.fit.edu/sealevelriselibrary/documents/doc\\_mgr/436/Hawaii\\_&\\_US\\_DOE\\_Sustainable\\_Energy\\_MOU.pdf](http://research3.fit.edu/sealevelriselibrary/documents/doc_mgr/436/Hawaii_&_US_DOE_Sustainable_Energy_MOU.pdf) [hereinafter HCEI MOU].

2. *Id.*

3. Energy Agreement Among the State of Hawaii, Division of Consumer Advocacy of the Department of Commerce and Consumer Affairs, and the Hawaiian Electric Companies, Oct. 2008, <http://files.hawaii.gov/dcca/dca/HCEI/HECI%20Agreement.pdf>. The Agreement was subsequently amended. *See* Amendment No. 1, Oct. 2008, <http://files.hawaii.gov/dcca/dca/HCEI/EAA01.pdf>; Amendment No. 2, Sept. 14, 2008, [https://energy.hawaii.gov/wp-content/uploads/2011/10/EnergyAgmt\\_Amendment-No-2\\_Sept2014.pdf](https://energy.hawaii.gov/wp-content/uploads/2011/10/EnergyAgmt_Amendment-No-2_Sept2014.pdf).

4. HCEI MOU, *supra* note 1.

5. The Renewable Portfolio Standard (RPS) is set by law, so the RPS modification needed to be implemented via legislative enactment, which the legislature completed in 2009. HAW. REV. STAT. § 269-92 (2015).

6. *See infra* Figures 5 and 6 and accompanying notes.

and agricultural resources, and is populated by environmentally friendly voters.<sup>7</sup> Renewables in Hawai'i therefore held out the promise of not only reducing emissions, but also reducing electric bills and winning votes.

A decade on, however, the ambitions of 2008 remain unrealized. As I recount in Part I of this Article, the last decade has seen the failure of the Hawaiian Electric Companies' early biofuel-led approach to the renewable energy transformation, the failure of the 400 MW "Big Wind" plan, the failure of ten of the eleven wind and solar projects competitively selected in 2013, the collapse of the rooftop solar industry amid economic policy disputes, and the analytical paralysis of a five-year resource planning effort, which ended without a firm commitment by Hawai'i's utilities to a roadmap for the clean energy transition.<sup>8</sup>

At present, Hawai'i's electricity system obtains approximately 25 percent of its energy from renewable sources,<sup>9</sup> which is up appreciably from the approximate 10 percent share of generation that prevailed in 2008,<sup>10</sup> and within striking distance of the 30 percent Renewable Portfolio Standard Hawai'i hopes to achieve by 2020<sup>11</sup> However, the majority of this progress came from individual residents and businesses who decided for themselves to "go solar," not from the regulated utility system leaders who committed in 2008 to transformative change.<sup>12</sup> Moreover, the 25 percent share of renewable energy in Hawai'i remains significantly below the 35 percent share that has been achieved in California.<sup>13</sup> Worse, Hawai'i's nonrenewable generation is fueled entirely by petroleum products and coal, which emit more greenhouse gas per kilowatt-hour (kWh) than the natural gas-fired generation that is common on the mainland.<sup>14</sup> Consequently, Hawai'i's grid emits about 35 percent more greenhouse gas per kWh than the national average.<sup>15</sup> Hawai'i continues to enjoy something of an unexamined national reputation as an electricity-policy innovator,<sup>16</sup> but Hawai'i

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7. See *infra* Figures 4–6 and accompanying notes; Brian Kennedy, *Public Support for Environmental Regulations Varies by State*, PEW RES. CTR. (FEB. 25, 2016), <http://www.pewresearch.org/fact-tank/2016/02/25/public-support-for-environmental-regulations-varies-by-state/> (showing that environmental protection polls more highly in Hawai'i than any state except Vermont).

8. See *infra* Part I.C (describing these events in more detail).

9. See *infra* Figure 4 and accompanying note.

10. See *infra* Figure 4 and accompanying note.

11. See HAW. REV. STAT. § 269-92(a)(3) (2015).

12. See *infra* Figures 4 and 5 and accompanying notes.

13. *California Renewables Portfolio Standard (RPS)*, CAL. PUB. UTIL. COMM'N, [http://www.cpuc.ca.gov/RPS\\_Homepage/](http://www.cpuc.ca.gov/RPS_Homepage/) (last visited Nov. 7, 2018).

14. See *infra* Figure 5 and accompanying note; *Frequently Asked Questions*, U.S. ENERGY INFO. ADMIN. (June 8, 2018), <https://www.eia.gov/tools/faqs/faq.php?id=73&t=11>.

15. See *infra* Figure 5.

16. See, e.g., Davide Savenije & Claire Cameron, *Hawaii's Overhaul of the Utility Business Model*, UTILITY DIVE (May 7, 2014), <https://www.utilitydive.com/news/Hawaiis-overhaul-of-the-utility-business-model/259923/>; Bentham Paulos, *Postcard From the Grid's Future: Hawaii as a Solar Laboratory*, GREENTECH MEDIA (Feb. 13, 2014), <https://www.greentechmedia.com/articles/read/postcard-from-the-grids-future-hawaii-as-a-solar-laboratory#gs.bEbu6SE>.

has not yet made good on its ambition to lead a clean-energy revolution of global significance.<sup>17</sup>

In Part II of this Article, I analyze why the last decade has proved disappointing. Politics is not to blame: the consensus in favor of renewables is as strong as ever in Hawai‘i. Indeed, Hawai‘i’s legislature has now committed the state to obtain 100 percent of its electricity from renewables by 2045.<sup>18</sup> Nor can we blame technology or economics. Analyses by national laboratories, consultants, and Hawai‘i utilities have repeatedly demonstrated that it is technologically feasible and economically attractive to execute aggressive moves towards renewable energy.<sup>19</sup> The problem is law. In part because its wholly intrastate grids lie beyond the Federal Energy Regulatory Commission’s (FERC) jurisdiction, the waves of comprehensive industry restructuring that shook the mainland in the 1990s never broke on Hawai‘i’s shores.<sup>20</sup> Instead, Hawai‘i preserved its traditional, vertically integrated natural-monopoly industry model, but layered on top of it a new Competitive Bidding Framework and net energy metering policy, intended to encourage competition between utilities and non-utility generation owners in the wholesale generation sector.<sup>21</sup> The hybridization of these two models leaves Hawai‘i’s utilities in control of planning and operating Hawai‘i’s electricity systems and preserves their economic incentive to develop utility-owned generation, yet asks them to open their systems to competitors on an impartial basis.<sup>22</sup> The result is a stalemate in which both utilities and independent power producers (IPPs) want to develop renewable energy projects, and both have enough power to frustrate many of the other’s projects, but neither typically has enough power to complete its own projects.<sup>23</sup>

This fundamental incentives problem is no secret to the participants in Hawai‘i’s electricity sector, but its importance has been consistently underestimated. In particular, Hawai‘i’s Public Utilities Commission (PUC) has until very recently tended to downplay the legal issues related to industry regulatory structure in favor of a focus on engineering-based supervision of utility planning and procurement activities.<sup>24</sup> At Hawai‘i industry conferences,

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17. Of course, it is possible for those who have an interest in portraying the history of the last ten years in a more favorable light to cherry-pick some success stories. *See, e.g.*, NAT’L RENEWABLE ENERGY LAB., CELEBRATING 10 YEARS OF SUCCESS: HAWAII CLEAN ENERGY INITIATIVE 2008–2018, Jan. 2018, <https://www.nrel.gov/docs/fy18osti/70709.pdf>.

18. HAW. REV. STAT. § 269-92(a)(6) (2015).

19. *See infra* Figure 7 and accompanying note.

20. *See infra* Part II.B.

21. *See infra* Part II.B–C.

22. *See infra* Part II.D.

23. *See infra* Part II.D. This theme draws on Francis Fukuyama’s argument that contemporary U.S. government has enfranchised too many “veto players” with the power to prevent action. FRANCIS FUKUYAMA, POLITICAL ORDER AND POLITICAL DECAY 490–97 (2014).

24. *See infra* Part II.E. Interest in fundamental structural reform for Hawai‘i, however, has been increasing over the last two years. Studies on alternative utility models have been commissioned by the County of Maui, U.S. Department of Energy, and the Hawaii State Government. *See generally* FILSINGER ENERGY PARTNERS, EVALUATION OF ALTERNATIVE OWNERSHIP OPTIONS FOR ELECTRIC UTILITY

paean are commonly made to “paddling the canoe in the same direction,”<sup>25</sup> but these exhortations will be ineffective as long as electricity regulation continues to give participants strong incentives (indeed obligations) to paddle the canoe in opposite directions.

In Part III of this Article, I analyze the policy interventions that could be used to improve incentives in Hawai‘i’s electricity system. There are three distinct levers: (1) rates, (2) industry structure, and (3) governance. Performance-based rates use traditional public-utility rate regulation to set rates that tie utility income to renewable energy progress.<sup>26</sup> Restructuring imposes prohibitions on vertical integration that eliminate utilities’ incentive or power to resist the development of renewable energy projects by third parties.<sup>27</sup> Municipalization or cooperatization brings the governance of Hawai‘i’s electric utilities under public control, so that they can be managed in the public interest.<sup>28</sup>

I argue that performance-based rate schemes are not likely to prove effective, because the difficult process of setting such rates will be warped by the same incentives problems that currently warp utility planning and procurement.<sup>29</sup> Restructuring initiatives that attempt to implement the crude wheeling or contract path model—such as contemporary efforts to replace rooftop solar management with a “transactive energy” framework—will prove no more successful than previous attempts, because the wheeling model fails to take into account the fundamental physical architecture of electricity grids.<sup>30</sup> On the other hand, more sophisticated restructuring initiatives patterned on the mainland independent system operator (ISO) model are also not a good fit in Hawai‘i. Hawai‘i’s electricity systems are too small to host workably competitive markets, which is a critical prerequisite to the success of the ISO

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ASSETS ON THE ISLAND OF OAHU AND HAWAII (2016), <https://www.hnei.hawaii.edu/sites/www.hnei.hawaii.edu/files/Evaluation%20of%20Alternative%20Ownership%20Options%20for%20Electric%20Utility%20Assets%20on%20Oahu%20and%20Hawaii.pdf> [hereinafter Filsinger Report]; GUERNSEY, ANALYSIS OF ALTERNATIVE FORMS OF OWNERSHIP AND ALTERNATIVE BUSINESS MODELS FOR MAUI COUNTY’S ELECTRIC UTILITY COMPANY (Dec. 23, 2015), <http://mauinow.com/files/2016/01/Analysis-of-Alternative-Forms-of-Ownership-and-Alternative-Business-Models-for-Maui-County-Electric-Utility-Company.pdf> [hereinafter Guernsey Report]. However, no article has yet explored the potential options from a “legal” perspective.

25. See, e.g., *Paddling Towards Sustainability with the Spirit of Aloha*, GREENBIZ (Sept. 13, 2017), <https://www.greenbiz.com/video/paddling-towards-sustainability-spirit-aloha>.

26. See *infra* Part III.A.

27. See *infra* Part III.B.

28. See *infra* Part III.C.

29. On this point, I respectfully disagree with the emphasis that local nonprofit, The Blue Planet Foundation, puts on performance-based ratemaking. See HAW. PUB. UTIL. COMM’N, DOCKET 2013-0141, BLUE PLANET FOUNDATION’S REPLY STATEMENT OF POSITION ON SCHEDULE B ISSUES, DECLARATION OF RONALD J. BINZ (Sept. 15, 2014), <https://dms.puc.hawaii.gov/dms/DocumentViewer?pid=A1001001A14I16B05435B09506>.

30. On this point, I am skeptical of some of the usefulness of the PUC’s efforts to move towards a complex “transactive energy” framework in Phase II of its distributed energy resources policy docket, for reasons I describe in more detail *infra* Part III.C.

model.<sup>31</sup> Moreover, even where the ISO model has been successfully implemented, it has not outperformed other models.<sup>32</sup>

Two alternative options have more potential. Divestiture of utility generation to form generation-free “TransCos”<sup>33</sup> is a simpler and better approach to restructuring.<sup>34</sup> This approach was successfully implemented in the United Kingdom,<sup>35</sup> and has the potential to address Hawai‘i’s incentives problems without endangering the stability or economic efficiency of Hawai‘i’s electricity system. Alternatively, the transfer of privately owned utilities to a municipality or electricity cooperative is also a proven means of aligning incentives with the public interest, which could work in Hawai‘i.<sup>36</sup>

## I. BACKGROUND

This Part sets up the analysis to follow by describing the engineering constraints that shape Hawai‘i’s efforts to expand renewable generation, assessing Hawai‘i’s progress on its renewable energy ambitions during the last decade, and summarizing the recent long-term utility resource planning results that validate the intuition that a renewable energy transformation makes both environmental and economic sense in Hawai‘i.

### A. A Portrait of Hawai‘i’s Electricity System

Hawai‘i’s electricity system consists of six separate transmission and distribution grids,<sup>37</sup> one for each major populated island. As shown in Figure 1,

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31. See *infra* Part III.B.4.

32. See *id.* On this point, I disagree with the recommendation of Guernsey, a consultant hired to study alternative business models on Maui. See Guernsey Report, *supra* note 24, at 23.

33. The “TransCo” moniker is an imperfect description of how this policy would be implemented in Hawai‘i, where there is little high-voltage transmission, and no practical distinction between such transmission grids and distribution grids. “DistCo” or “TransDistCo” might be a better name for the form I recommend the policy take in Hawai‘i. However, I use the “TransCo” name throughout this Article to connect the concept to the useful discourse on TransCos that took place in the 1990s (and which is described in more detail below).

34. See *infra* Part III.B.5.

35. Peter Fox-Penner et al., *A Trip to RIIO in Your Future? Great Britain’s Latest Innovation in Grid Regulation*, PUB. UTIL. FORT., Oct. 2013, at 60, 64, [http://files.brattle.com/files/7425\\_a\\_trip\\_to\\_riio\\_in\\_your\\_future.pdf](http://files.brattle.com/files/7425_a_trip_to_riio_in_your_future.pdf).

36. See *infra* Part III.C.

37. See HAW. DEP’T OF BUS., ECON. DEV. & TOURISM, HAWAII ENERGY FACTS & FIGURES 2 (2014), [https://energy.hawaii.gov/wp-content/uploads/2014/11/HSEO\\_FF\\_Nov2014.pdf](https://energy.hawaii.gov/wp-content/uploads/2014/11/HSEO_FF_Nov2014.pdf). In industry parlance, “transmission” infrastructure refers to the wires that carry high-voltage electricity across large distances, such as from remotely sited power plants to populated areas, and “distribution” infrastructure refers to lower voltage wires that carry electricity through neighborhoods to end users. See HARRIS WILLIAMS & CO., TRANSMISSION & DISTRIBUTION INFRASTRUCTURE 1 (2014), [https://www.harriswilliams.com/sites/default/files/industry\\_reports/ep\\_td\\_white\\_paper\\_06\\_10\\_14\\_final.pdf](https://www.harriswilliams.com/sites/default/files/industry_reports/ep_td_white_paper_06_10_14_final.pdf). High-voltage transmission is stepped down to low-voltage distribution at the “T-D interface.” See U.S. DEP’T OF ENERGY, THE TRANSMISSION-DISTRIBUTION INTERFACE 1 (2018), [https://www.energy.gov/sites/prod/files/2018/06/f53/EAC\\_Transmission-Distribution%20Interface%20%28June%202018%29.pdf](https://www.energy.gov/sites/prod/files/2018/06/f53/EAC_Transmission-Distribution%20Interface%20%28June%202018%29.pdf). In many states, the transmission/distribution distinction is not only a



five of these six grids are owned and operated by the Hawaiian Electric Company (HECO) and its subsidiaries, Maui Electric Company (MECO) and Hawai'i Electric Light Company (HELCO)<sup>38</sup> The grid on the island of Kaua'i is owned and operated by the Kaua'i Island Utility Cooperative (KIUC), a customer-owned cooperative.<sup>39</sup>

| Island     | Utility | Customers | Peak Load (MW) | Utility Fossil Fuel Gen. (MW) | IPP Fossil Fuel Gen. (MW) | IPP Renewable Gen. (MW) | Rooftop Solar (MW) |
|------------|---------|-----------|----------------|-------------------------------|---------------------------|-------------------------|--------------------|
| O'ahu      | HECO    | 304,261   | 1150           | 1191                          | 388                       | 185                     | 392                |
| Big Island | HELCO   | 85,029    | 210            | 182                           | 60                        | 86                      | 79                 |
| Maui       | MECO    | 70,872    | 200            | 248                           | 0                         | 74                      | 87                 |
| Moloka'i   | MECO    | -         | 6              | 15                            | 0                         | -                       | -                  |
| Lana'i     | MECO    | -         | 5              | 11                            | 0                         | -                       | -                  |
| Kaua'i     | KIUC    | 33,000    | 77             | 124                           | 0                         | 84                      | 20                 |

Figure 1: Overview of Hawai'i's Electricity System<sup>40</sup>

physical border but also a regulatory one: for example, FERC's Federal Power Act (FPA) jurisdiction generally ends at the T-D interface, as does that of ISOs; state public utilities commission generally exercise exclusive jurisdiction over distribution utilities. See JEFFERY S. DENNIS ET AL., FEDERAL/STATE JURISDICTIONAL SPLIT: IMPLICATIONS FOR EMERGING ELECTRICITY TECHNOLOGIES 2-3, 10-12 (2016), <https://www.energy.gov/sites/prod/files/2017/01/f34/Federal%20State%20Jurisdictional%20Split--Implications%20for%20Emerging%20Electricity%20Technologies.pdf>. However, in Hawai'i the transmission/distribution distinction is relatively unimportant, because relative to the mainland, distances are small, voltages are low, FERC has no FPA jurisdiction, and a single utility on each island owns all transmission and distribution.

38. Collectively, HECO, MECO, and HELCO are referred to herein as the "HECO Companies."

39. *About KIUC*, KAUA'I ISLAND UTIL. COOP., <http://website.kiuc.coop/about> (last visited Nov. 7, 2018).

40. See HAWAIIAN ELECTRIC COMPANIES PSIPs UPDATE REPORT D-1-D-32 (Dec. 23, 2016), <http://cca.hawaii.gov/dca/hecos-psip-update-december-2016/> [hereinafter December 2016 PSIP] (detailing HECO Companies' generation capacities); *id.* at D-33 (detailing HECO Companies' rooftop solar percentage); *Power Facts*, HAWAIIAN ELEC. CO., <https://www.hawaiianelectric.com/about-us/power-facts> (detailing HECO Companies' customers numbers) (last visited Nov. 7, 2018); December 2016 PSIP, *supra*, at J-35-J-37 (detailing the HECO Companies' peak demand forecasts); *Energy Information*, KAUA'I ISLAND UTIL. COOP., <http://website.kiuc.coop/energy-information> (last visited Nov. 7, 2018); KAUA'I ISLAND UTIL. COOP., 2016 UTILITY REPORT, <http://kiuc.coop/webbuilder2.com/sites/kiuc/files/PDF/annualreport/AnnualReport2016.pdf>, KAUA'I ISLAND UTIL. COOP., RENEWABLE PORTFOLIO STANDARDS (RPS) STATUS REPORT YEAR ENDING DECEMBER 31, 2016 (2017), <https://puc.hawaii.gov/wp-content/uploads/2013/07/RPS-KIUC-2016.pdf> (detailing, collectively, KIUC electricity information). Note that the "customers" and "rooftop solar" figures for Maui include Moloka'i and Lana'i, and that small (< 5MW) amounts of utility-owned hydroelectric capacity may be included in the "IPP Renewable Generation" figures for Kaua'i and Big Island.

As with all electricity grids, the core engineering constraint around which Hawai‘i’s systems are designed is the need to instantaneously match electricity demand (“load”) to electricity generation.<sup>41</sup> Every time a Hawai‘i resident flips a light switch, load increases or decreases slightly, and the utility’s generation must increase or decrease by an infinitesimal amount to match the change in load. If generation does not match load, frequency will deviate from its target value (60 hertz).<sup>42</sup> Significant deviations can lead to cascading system instability and blackouts. Thus, the utility must continuously balance the system by instantaneously matching its generation to its customers’ needs.<sup>43</sup>

A utility meets this challenge by planning and dispatching a suitable portfolio of power plants and related resources.<sup>44</sup> In particular, it must ensure that its portfolio provides sufficient “ancillary services,” such as fast frequency response capable of instantaneously responding to fluctuations in electricity load and generation, as well as reserve generation available to come online for longer periods of time when needed.<sup>45</sup> Traditionally, the utility provides itself with sufficient ancillary services by idling certain fossil-fueled power plants at a level below their maximum generation potential, such that the utility can quickly increase or decrease their generation in response to fluctuations in load or the output of other generators.<sup>46</sup> As renewable generation displaces fossil-fueled generation, the HECO Companies are increasingly planning to supplement this traditional ancillary services technique with batteries, demand response, and dispatchable intermittent renewable facilities.<sup>47</sup>

Figures 2 and 3 below provide a concrete illustration of the system balancing process, using utility data about the operation of the Maui electricity system.<sup>48</sup> The “Total Load” line at the top of Figure 2 shows total electricity usage on Maui over a twenty-four-hour period. Until recently, all of this electricity demand would have been served by MECO, but with the mass adoption of rooftop solar over the last several years, some of the load is now served by customer-owned equipment.<sup>49</sup> As a result, MECO sees a substantial

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41. See December 2016 PSIP, *supra* note 40, at App’x O (noting constraints as they relate to system planning).

42. *Id.* at O-4.

43. *Id.* at O-1–O-4.

44. For example, in addition to generation resources, the utility may plan transmission line infrastructure in a way that ensures it will move electricity throughout the system, and use “demand response” programs to reduce load on command (a technique that is often more economical than increasing generation on command).

45. December 2016 PSIP, *supra* note 40, at O-15.

46. *Id.* at O-1–O-2.

47. *Id.* at O-15.

48. Maui has been selected as an example because the relatively smaller number of units compared to O‘ahu allows for a more concise and clear explication of the system balancing issues of relevance to this Article. A “typical” day in the life of the O‘ahu grid would look similar, but with a larger number and diversity of fossil fuel fired units, and a smaller percentage of wind generation. See *supra* Figure 1.

49. See *infra* Figure 2.

“valley” in the daytime load it is asked to serve.<sup>50</sup> The diagram shows how MECO “fills” the load it is asked to serve with resources stacked in priority order from bottom to top.<sup>51</sup> The bottom layer depicts must-run output from MECO’s DTCC1 unit, a utility-owned, petroleum-fired combined cycle power plant located in Ma‘alaea, as well as its K4 steam turbine unit, located in Kahului.<sup>52</sup> Together, these must-run units have a maximum output of about 66 MW and a minimum output of 39.5 MW.<sup>53</sup> By designating the units as “must run” at their minimum levels, MECO gives itself up to 26.5 MW of headroom that it can use to balance its system.<sup>54</sup> For example, if output from Maui’s wind farms falls off due to a decrease in wind speed, or if electricity usage increases unexpectedly, MECO will be able to quickly ramp up production from its must-run units to prevent an imbalance.

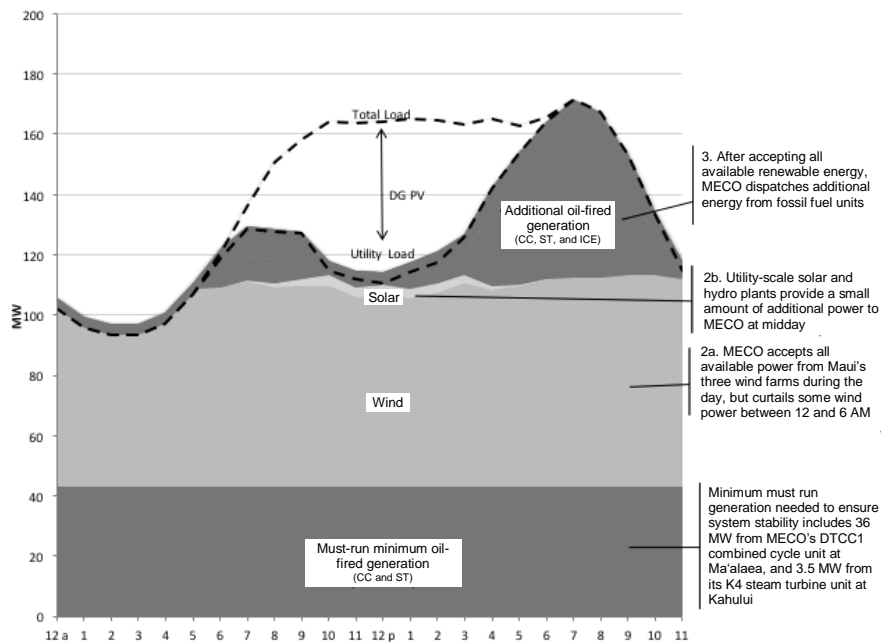


Figure 2: Example of MECO System Operations (Windy Day)<sup>55</sup>

50. See *infra* Figure 2.

51. See *infra* Figure 2.

52. See *infra* Figure 2.

53. See *infra* Figure 2.

54. See *infra* Figure 2.

55. See HAW. PUB. UTIL. COMM’N, DOCKET 2014-0183, HAWAIIAN ELECTRIC COMPANIES’ RESPONSES TO THE COMMISSION’S INFORMATION REQUESTS (Oct. 10, 2014), <http://puc.hawaii.gov/trending-dockets/2014-0183-instituting-a-proceeding-to-review-the-power-supply-improvement-plans-for-hawaiian-electric-company-inc-hawaii-electric-light-company-inc-and-maui-electric-company-limited/> [hereinafter 2014 PSIP IR 21 Data] (detailing MECO data produced). The data used in the figure is a simulation for June 3, 2015.

After dispatching the minimum must-run generation needed to preserve system stability, MECO must accept all available electricity from Maui's three wind farms.<sup>56</sup> These wind farms are owned by IPPs that sell wholesale power to MECO under long term "as available" power purchase agreements.<sup>57</sup> These agreements require MECO to generally accept all of the electricity available from the wind farms before dispatching any other generation.<sup>58</sup> Finally, after accepting the must-run generation and as-available generation, MECO fills in the remaining load by dispatching units under its control in inverse cost order. In this case, it meets additional demand in the daytime and evening hours in part by increasing generation from the DTCC1 unit, in part by activating internal combustion engine units, and in part by using additional generation from the K4 unit.<sup>59</sup>

Figure 3 illustrates how significantly this day-in-the life story can change due to weather. While Figure 2 is based on data for a high-wind, high-sun day (June 3, 2015), Figure 3 is based on data for a low-wind day (December 16, 2015), of the type that is not uncommon on Maui in December and January. Because of the low output of Maui's wind farms, MECO ends up fully utilizing the output of its DTCC1 unit, and must also activate a number of other internal combustion units.<sup>60</sup> Figure 3 thus underscores that while wind generation can displace a large share of fossil fuel generation on Maui on "good days," MECO still must maintain adequate firm generation that allows the utility to meet load on "bad days." This means that if Maui is to go 100 percent renewable, it cannot rely on wind and solar alone. It must also develop some combination of large-scale energy storage and always-available renewable dispatchable generation, such as geothermal, biomass, or liquid biofuel generation.

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56. December 2016 PSIP, *supra* note 40, at M-40-M-41.

57. *Id.*

58. *See id.* However, the agreements contain an exception from the must-purchase requirement that allows MECO to "curtail" the wind farms' purchases when MECO has already turned down its must-run units as much as it possibly can without endangering system stability. On this day, the data shows that some wind energy is curtailed between 12 AM and 5 AM. *See generally* 2014 PSIP IR 21 Data, *supra* note 55. Specifically, with the "must run" DTCC1 and K4 units turned down to their minimum (39.5 MW), sufficient energy demand does not exist to make use of all of the energy produced by the wind farm, so MECO orders one or more of the wind farms to reduce its output in order to match demand. *See id.*

59. *See supra* Figure 2.

60. *See infra* Figure 3.

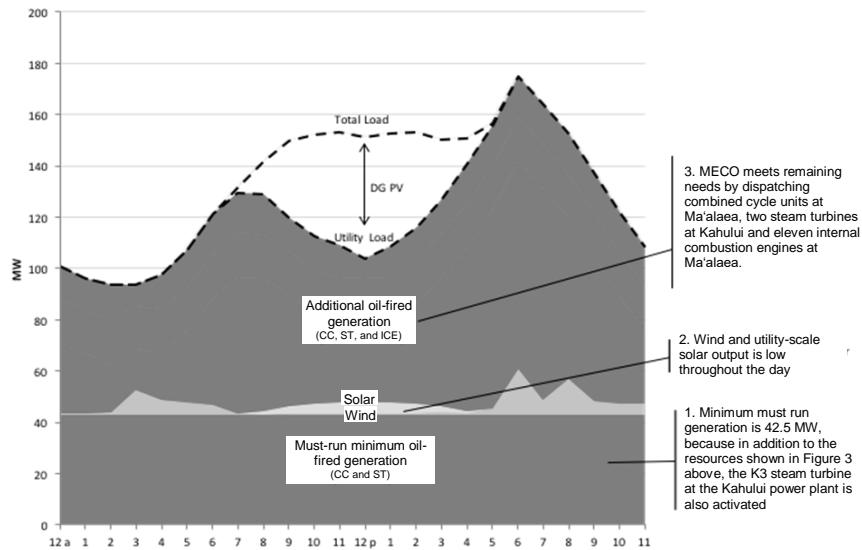


Figure 3: Example of MECO System Operation (Low-Wind day)<sup>61</sup>

### B. Hawai'i's Renewable Progress over the Last Decade

Aggregated over a full year, the day-to-day dispatch of these generation portfolios determine Hawai'i's annual electricity resource mix. Figure 4 depicts the evolution of this mix over the last decade. Four trends are visible. First, utility customers reduced their total energy utilization, even as the economy and population expanded.<sup>62</sup> This achievement can be attributed in part to high electricity prices, and in part to a related increase in customer-side energy efficiency from the adoption of more efficient appliances and lifestyles.<sup>63</sup> Second, utilities on O'ahu and Maui procured amounts of energy from several new wind farms on those islands, significantly increasing the height of the "wind" bar segments in the diagram.<sup>64</sup> Third, waste-to-energy projects were expanded on O'ahu, and biomass generation was expanded on Kaua'i, which are barely visible as an increase in the "other renewables" bar segments.<sup>65</sup> Finally,

61. Author's calculations. See 2014 PSIP IR 21 Data for December 15, 2015, *supra* note 55.

62. *County Social, Business and Economic Trends in Hawaii*, HAW. DEP'T OF BUS., ECON. DEV. & TOURISM, [http://dbedt.hawaii.gov/economic/reports\\_studies/county\\_report/](http://dbedt.hawaii.gov/economic/reports_studies/county_report/) (last visited Nov. 7, 2018).

63. To the extent that there is a "policy" aspect to this success story, it is the PUC's decision in 2008 to remove energy efficiency promotion programs from utility control, and transfer to an independent entity known as Hawai'i Energy. See *Hawaii Energy*, U.S. DEP'T OF ENERGY, <https://www.energy.gov/savings/hawaii-energy> (last visited Nov. 7, 2018).

64. Duane Shimogawa, *NextEra Energy Plans to Build Hawaii's Largest Wind Farm on Maui*, PAC. BUS. NEWS (Feb. 20, 2015), <https://www.bizjournals.com/pacific/news/2015/02/20/nextera-energy-plans-to-build-hawaii-largest-wind.html> (describing previous completed wind projects).

65. See, e.g., Robert Peltier, *Expanded Honolulu WTE Plant Delivers Triple Benefits for Oahu*, Power (Mar. 3, 2013), <https://www.powermag.com/expanded-honolulu-wte-plant-delivers-triple-benefits-for-oahu/>; *Biomass*, KAUAI ISLAND UTIL. COOP., <http://kiuc.coopwebbuilder2.com/content/biomass> (last visited Nov. 9, 2018).

the rooftop solar industry exploded from virtually nothing in 2007 to 9 percent of total generation in 2017—by far the most significant renewable achievement visible in the data.<sup>66</sup>

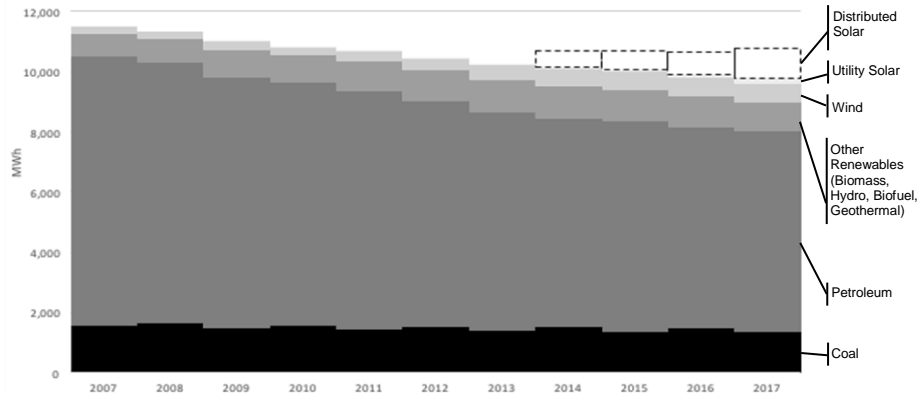


Figure 4: Hawai‘i’s Progress on Renewables, 2007–2017<sup>67</sup>

Figure 5 compares Hawai‘i utilities’ 2017 resource mix to the national average. Hawai‘i utilities’ renewable energy generation is approaching the national average (15 percent of total utility generation in Hawai‘i, compared to the national average of 17 percent). However, rooftop solar in Hawai‘i (9 percent of total generation) has far outstripped rooftop solar’s progress on a national level (where it accounts for less than 1 percent of total generation). As a result, Hawai‘i’s total renewable percentage exceeds the national average (24 percent for Hawai‘i; 18 percent nationwide). Nevertheless, the vast majority of electricity in Hawai‘i (76 percent) is still derived from fossil fuels. Moreover, Hawai‘i relies primarily on petroleum fuel (63 percent), which is barely used at all for electricity generation in the rest of the United States, and petroleum-fired plants generate more greenhouse gas emissions per kWh than the natural gas and nuclear generation that is prevalent on the mainland.<sup>68</sup> As a result, Hawai‘i’s electricity grid remains dirtier in terms of CO<sub>2</sub> released per kWh generated than the average mainland electricity grid—0.58 kg per kWh, compared to the national average of around 0.43 kg per kWh.<sup>69</sup>

66. See *infra* Figure 4 and accompanying note.

67. *Electricity Data Browser*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/electricity/data/browser/#/topic/0?agg=2,0,1&fuel=vtvv&geo=00000000000008&sec=g&linechart=ELEC.GEN.ALL-HI-99.A&columnchart=ELEC.GEN.ALL-HI-99.A&map=ELEC.GEN.ALL-HI-99.A&freq=A&start=2007&end=2016&ctype=linechart&ltype=pin&rtype=s&pin=&rse=0&motype=0> (compiling annual data for net generation for all sectors). Note that distributed solar data is not available in the data series prior to 2014, and that the Energy Information Administration figures differ somewhat from the 2017 resource mix snapshot presented in Figure 5. Additionally, the Energy Information Administration did not provide pre-2014 data on rooftop solar, which is why that data series is discontinuous in the diagram.

68. See *infra* Figure 5 and accompanying note.

69. See *infra* Figure 5 and accompanying note.

|  | HECO | HELCO | MECO | All<br>HEI <sup>70</sup> | KIUC | All<br>Haw. | All<br>U.S. |
|--|------|-------|------|--------------------------|------|-------------|-------------|
| Utility  |      |       |      |                          |      |             |             |
| Traditional                                      |      |       |      |                          |      |             |             |
| Coal (.95 kg<br>CO <sub>2</sub> e/kWh)           | 19%  | 0%    | 0%   | 14%                      | 0%   | 13%         | 30%         |
| Petroleum<br>(.73 kg<br>CO <sub>2</sub> e/kWh)   | 63%  | 53%   | 71%  | 63%                      | 60%  | 63%         | 0%          |
| Natural Gas<br>(.53 kg<br>CO <sub>2</sub> e/kWh) | 0%   | 0%    | 0%   | 0%                       | 0%   | 0%          | 20%         |
| Nuclear  | 0%   | 0%    | 0%   | 0%                       | 0%   | 0%          | 32%         |
| Total  | 82%  | 53%   | 71%  | 77%                      | 60%  | 76%         | 82%         |
| Utility  |      |       |      |                          |      |             |             |
| Renewables                                       |      |       |      |                          |      |             |             |
| Solar  | 3%   | 9%    | 18%  | 5%                       | 0%   | 5%          | 6%          |
| Wind   | 2%   | 0%    | 1%   | 1%                       | 14%  | 2%          | 1%          |
| Hydro  | 0%   | 2%    | 0%   | 0%                       | 6%   | 1%          | 8%          |
| Geothermal                                       | 0%   | 26%   | 0%   | 3%                       | 0%   | 3%          | 0%          |
| Biomass (Incl.<br>Waste-to-<br>Energy)           | 5%   | 0%    | 0%   | 4%                       | 9%   | 4%          | 2%          |
| Biofuels   | 1%   | 0%    | 0%   | 1%                       | 0%   | 1%          | 0%          |
| Total  | 10%  | 37%   | 19%  | 15%                      | 30%  | 15%         | 17%         |
| Distributed Solar                                | 8%   | 10%   | 10%  | 9%                       | 10%  | 9%          | -           |
| Total Renewable<br>% of Generation               | 18%  | 48%   | 29%  | 23%                      | 40%  | 24%         | 18%         |
| RPS % (Hawai'i<br>Method) <sup>71</sup>          | 21%  | 57%   | 34%  | 27%                      | 44%  | 28%         | N/A         |
| Emissions Factor<br>(kg CO <sub>2</sub> e/kWh)   | 0.64 | 0.38  | 0.52 | 0.59                     | 0.44 | 0.58        | 0.43        |

Figure 5: 2017 Hawai'i Electricity Resource Mix & Emissions Intensity<sup>72</sup>

70. Hawaiian Electric Industries (HEI) is used throughout this Article to refer to the HECO Companies' corporate parent.

Hawai‘i’s unusually high reliance on fossil fuels is the most important proximate cause of Hawai‘i’s unusually high electricity rates, which are depicted in Figure 6. On a national basis, electricity prices have undergone fairly steady year-on-year inflation over the last two decades, but in Hawai‘i they have experienced catastrophic fluctuations. As oil prices increased to over \$100 per barrel in the economic expansion of the 2000s,<sup>73</sup> Hawai‘i’s electricity prices more than doubled, reaching a level approximately 3.5 times the national average in 2007. During the 2008 financial crisis, Hawai‘i’s prices plunged, only to rise once again as the Great Recession ended, again tracking oil prices. Lower prices have prevailed over the last several years, but remain approximately 2.5 times the national average, and may again be trending upwards.

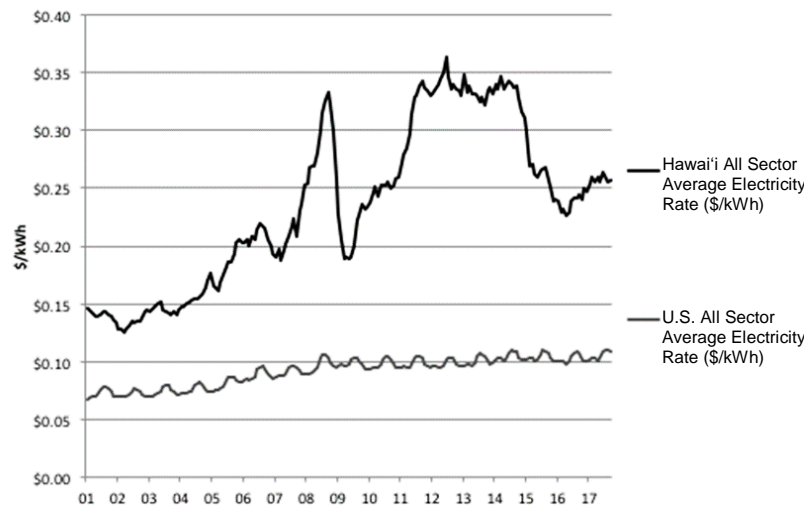


Figure 6: Hawai‘i Electricity Prices Compared to National Average, 2001–2017<sup>74</sup>

71. Note that the calculation of the RPS percentage in Hawai‘i is illogical. Distributed generation (rooftop solar) is credited to the utility as renewable generation in the numerator of the RPS percentage, but also counted in the denominator of the calculation as a reduction in total load. Most of the figures used in this Article thus rely on the “Total Renewable % of Generation” line.

72. Author’s calculation. See *Renewable Portfolio Standards (RPS) Annual Reports*, CAL. PUB. UTIL. COMM’N, <http://puc.hawaii.gov/reports/energy-reports/renewable-portfolio-standards-rps-annual-reports/> (containing renewable generation statistics from HECO Companies’ and KIUC’s 2017 RPS Reports) (last visited Nov. 8, 2018); *Key Performance Metrics*, HAWAIIAN ELEC. CO., <https://www.hawaiianelectric.com/about-us/key-performance-metrics> (noting energy losses) (last visited Nov. 10, 2018); *Electricity*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/electricity/data.php> (listing U.S. generation data) (last visited Nov. 10, 2018); *Hawaii Profile Data*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/state/data.php?sid=HI#SupplyDistribution> (listing coal generation data) (last visited Nov. 10, 2018); U.S. DEP’T OF ENERGY, ENVIRONMENT BASELINE, VOLUME 1: GREENHOUSE GAS EMISSIONS FROM THE U.S. POWER SECTOR 18 (2016) (listing emissions factors).

73. See Jad Mouawad, *Oil Prices Pass Record Set in ‘80s, but Then Recede*, N.Y. TIMES (Mar. 3, 2008), <https://www.nytimes.com/2008/03/03/business/worldbusiness/03cnd-oil.html>.

74. *Electricity Data Browser*, U.S. ENERGY INFO. ADMIN., <https://www.eia.gov/electricity/data/browser/> (last visited Nov. 9, 2018).



### C. Why Renewable Energy Makes Sense in Hawai‘i

Numerous analyses suggest that Hawai‘i’s high-cost, high-emissions generation portfolio is not inevitable, but can be replaced with lower-cost renewable options. For example, the HECO Companies’ most recent PUC-mandated resource planning analyses (described in more detail below) suggest that solar and wind projects are unambiguously the lowest-cost power supply options in Hawai‘i.<sup>75</sup> In fact, wind and solar beat the fossil-fueled alternatives even at relatively low 2018 estimated fuel prices, as shown in the levelized cost figures presented in Figure 7. Both the HECO Companies and the U.S. Energy Information Administration (EIA) predict that fuel prices will climb by four times over the thirty-year useful life of a new power plant.<sup>76</sup> Thus, investment in a renewable facility today is expected to be dramatically more cost-effective than investment in a new fossil-fueled facility.

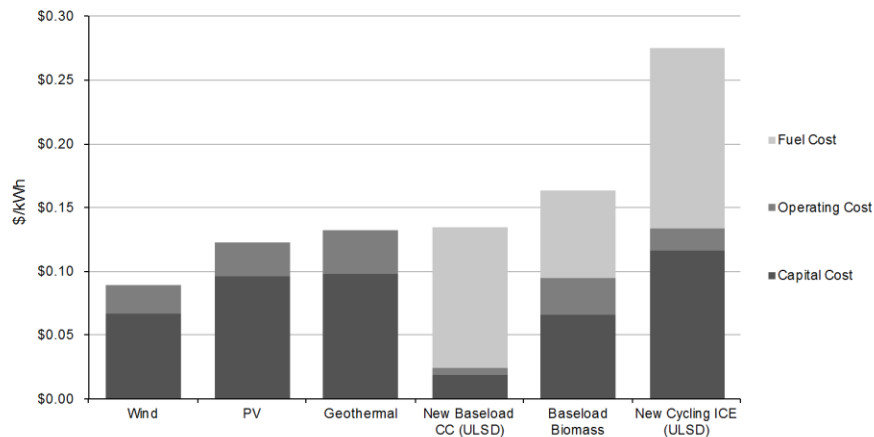


Figure 7: 2018 Levelized Cost of Energy (Estimates Based on Utility Assumptions)<sup>77</sup>

Of course, the operational constraints described above significantly complicate this analysis. A system could not run on wind or solar alone, because the utility requires ancillary services to keep it in balance. Whether ancillary services are obtained by idling traditional power plants or by building large-scale energy storage projects, the services have a cost, which raises difficult questions about how to select an optimal portfolio of generation resources.<sup>78</sup> It is therefore

75. See *infra* Part II.D.

76. December 2016 PSIP, *supra* note 40, at App’x J.

77. Author’s calculations. See *id.*

78. See, e.g., JURGEN WEISS & BRUCE TSUCHIDA, THE BRATTLE GROUP, INTEGRATING RENEWABLE ENERGY INTO THE ELECTRICITY GRID 10–11, 16 (2015), <http://info.aee.net/hubfs/EPA/AEEI-Renewables-Grid-Integration-Case-Studies.pdf?t=1440089933677> (summarizing research on the cost of integrating renewable energy and explaining the role of ancillary services).

not as simple as looking at a per-kWh price offered by a wind farm or solar farm. The only way to truly understand the costs and benefits at issue is to run a long-term system model that compares total simulated system cost in a “baseline” scenario to total simulated system cost in a “project” scenario incorporating the new resource.<sup>79</sup>

As explained in more detail below,<sup>80</sup> the HECO Companies have repeatedly conducted such analyses as part of their resource planning over the last decade, and the results suggest that portfolios can be constructed to aggressively increase the percentage of renewable generation while reducing cost relative to a business-as-usual baseline. In fact, the HECO Companies’ analysis of the cost of biomass and geothermal generation suggests that firm renewable options capable of replacing the fossil fuel units on a one-for-one basis are available at comparable cost, at least on some islands.

#### *D. The Current State of Play in Hawai‘i*

In short, ten years on from the Hawai‘i Clean Energy Initiative, the diagnosis and prescription arrived at in 2008 remain disappointingly current. Hawai‘i’s high reliance on imported petroleum products is still primarily responsible for its unusually high per-kWh contribution to global warming, as well as its unusually high retail electricity cost. The replacement of Hawai‘i utilities’ fossil fuel-heavy generation portfolios with renewables-based portfolios therefore still holds out the tantalizing prospect of decarbonizing Hawai‘i’s electricity grid while also reducing (or at the very least stabilizing) electricity rates.

Why, then, did so little change happen in the space of a decade? Ten years is enough time to expect significant progress: it took only four years for the United States to liberate Europe, and only nine to send astronauts to the moon. Even now, a string of glassy new condominium buildings rise just a few blocks from the offices of Hawai‘i’s utility leaders and energy policymakers, in noisy rebuke to the contemporaneous failure of so many renewable energy projects of similar cost and complexity.

## II. HOW INCENTIVES SLOW HAWAI‘I’S RENEWABLE ENERGY TRANSFORMATION

In this Part, I attempt to explain the puzzlingly slow progress towards a renewable transformation diagnosed in the previous Part. I argue that the fundamental problem is the incentives inherent in the laws that structure its electricity sector. Specifically, by leaving Hawai‘i’s traditional, vertically

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79. RACHEL WILSON & BRUCE BIEWALD, REGULATORY ASSISTANCE PROJECT, BEST PRACTICES IN ELECTRIC UTILITY INTEGRATED RESOURCE PLANNING 19 (2016) (describing several state regulations and recent utility plans, all of which rely on some form of scenario modeling).

80. See *infra* Part II.D.

integrated monopoly system in place while simultaneously demanding competition in the wholesale generation sector, electricity policymakers have created a bitter stalemate in which the key players have the power to frustrate each other's renewable generation plans, but no one has enough power to bring their own plans to completion.

*A. Hawai'i's Vertically Integrated, Regulated Utility Business Model*

The managers of Hawai'i's investor-owned utilities (HECO, MECO, and HELCO) have a duty to maximize the value of the enterprises to shareholders. The same is true of all publicly traded for-profit corporations, but in most industries, we rely on competition to ensure that the corporations price efficiently. By contrast, in "natural monopoly" industries like electricity distribution, it has long been understood that competition is less productively efficient than monopoly, and perhaps impossible.<sup>81</sup> At the same time, a productively efficient natural monopoly, no less than any other monopoly, will charge allocatively inefficient (too high) rates if allowed.<sup>82</sup> Cost-of-service regulation is a solution to this problem.<sup>83</sup> Its goal is to secure for society the productive efficiencies of natural monopolies while mitigating the cost to society of their allocatively inefficient prices. Invented in the late nineteenth and early twentieth centuries through the combined efforts of muckraking eastern journalists, populist Great Plains legislators, and the Supreme Court, this "peculiarly American institution" has now been practiced continuously in every state of the union for more than a century.<sup>84</sup>

In Hawai'i, cost-of-service regulation is administered by the PUC, which was originally set up in the early 1900s as an organ of Hawai'i's territorial government,<sup>85</sup> and currently exercises powers under Hawai'i Revised Statutes (HRS) Chapter 269. Under HRS Chapter 269, a Hawai'i utility can only charge

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81. Richard A. Posner, *Natural Monopoly and its Regulation*, 21 STAN. L. REV. 548, 548–49, 642 n.2 (1969); 1 ALFRED E. KAHN, *THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS* 2–14 (2d ed. 1988); 2 ALFRED E. KAHN, *THE ECONOMICS OF REGULATION: PRINCIPLES AND INSTITUTIONS* 125 (2d ed. 1988); CHARLES F. PHILLIPS, JR., *THE REGULATION OF PUBLIC UTILITIES* 43–47, 109 (1988); JOHN E. KWOKA, JR., *POWER STRUCTURE: OWNERSHIP, INTEGRATION, AND COMPETITION IN THE U.S. ELECTRICITY INDUSTRY* 1, 86–87 (1996); RICHARD HIRSH, *POWER LOSS: THE ORIGINS OF DEREGULATION AND RESTRUCTURING IN THE AMERICAN ELECTRIC UTILITY SYSTEM* 5, 16–17 (1999); CHARLES FRANCIS ADAMS, JR., *RAILROADS: THEIR ORIGIN AND THEIR PROBLEMS* 81 (1878); THOMAS C. MCCRAW, *PROPHETS OF REGULATION* 6, 9–10, 56 (1984). *See also* SCOTT HEMPLING, *REGULATING PUBLIC UTILITY PERFORMANCE: THE LAW OF MARKET STRUCTURE, PRICING, AND JURISDICTION* 69–188 (2013).

82. Posner, *supra* note 81, at 569.

83. PHILLIPS, JR., *supra* note 81, at 783. Most other nations use government ownership or more invasive government forms of control to address the problems the U.S. polities address with regulation.

84. *Id.*; GEORGE H. MILLER, *RAILROADS AND THE GRANGER LAWS* 161–71 (1971); HIRSH, *supra* note 81, at 2; MCCRAW, *supra* note 81, at 6, 56–58, 116. *See generally* *Munn v. Illinois*, 94 U.S. 113, 133–36 (1876).

85. *Commission History*, HAW. PUB. UTIL. COMM'N, <http://puc.hawaii.gov/about/history/> (last visited Nov. 14, 2018).

a rate that has been previously approved by the PUC through a formal adjudicative proceeding typically referred to as a “rate case.”<sup>86</sup> The PUC uses rate cases to generate a “revenue requirement”—i.e., the amount of revenue the utility is allowed to recover from its customers through its electricity sales. For a given year “t”, the PUC sets the revenue requirement pursuant to the following (highly simplified) formula:<sup>87</sup>

$$RR_t = (R_t * RB_t) + D_t + OC_t + T_t$$

Where:

RR = Revenue Requirement

R = Rate of return

RB = Rate base, or the amount of capital investment less accumulated depreciation

D = Depreciation

OC = Operating Costs

T = Taxes

The first two terms in this formula are intended to spread the costs of large capital investments over a number of years, and are the core of public utility finance.<sup>88</sup> For example, if the utility invests \$20 million in a new power plant and receives PUC approval to recover the investment from ratepayers over twenty years, it would include in its revenue requirement a \$1 million depreciation expense for each year in the twenty-year period, such that the sum of all the depreciation expenses for the whole period would exactly compensate the utility for the original \$20 million investment. Additionally, in each of those years, the utility would be allowed a return on the value of its investment net of depreciation, as compensation for putting up the capital for the investment. For example, assuming the PUC approves a 5 percent rate of return, in the fifth year of the twenty-year period the utility would receive a return on the depreciated rate base of \$750,000 ((\$20 million - \$5 million depreciation) x 5 percent).

In contrast to the depreciation and rate of return components of the formula, the operating cost and tax components are not intended to benefit utility shareholders.<sup>89</sup> Rather, the PUC simply adds its estimate of these costs to the revenue requirement, in order to pass the costs through the utility to customers on a one-for-one basis.<sup>90</sup> Thus, for example, utility shareholders do not profit

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86. HEMPLING, *supra* note 81, at 216–19.

87. *See id.*

88. *See id.*

89. *See id.*

90. Traditionally, rates were adjusted for operations costs only during formal “rate case” proceedings, and utilities bore the risk of rising operating costs or falling electricity demand between rate cases. *See id.* However, Hawai‘i’s utilities now benefit from several ratemaking innovations that allow the automatic adjustment of rates between rate cases, including fuel cost pass-through clauses, revenue decoupling (known in Hawai‘i as the RBA), and automatic rate-basing of “baseline” capital investment through a mechanism known as the RAM. *See, e.g.*, Haw. Pub. Util. Comm’n, Public Utilities Commission Issues Final Decision Approving a Decoupling Mechanism for the Hawaiian Electric Companies to Encourage Their Support for Renewable Energy and Energy Efficiency Initiatives (Aug. 31, 2010),

from the purchase of fuel for the utility's plants, the utility's employment of staff to run the plants, or—significantly—the purchase of power from IPPs.

Once the revenue requirement is established through the above formula, average rates can be calculated by dividing the revenue requirement by the number of kWh of electricity that the utility expects to sell. For example, if MECO has a \$500 million total revenue requirement and expects to sell 1,250,000 kWh per year, the PUC could allow it to charge \$0.40 per kWh, on average.<sup>91</sup> In other words, rates are set so as to allow the utility to earn a return only on its investment in rate-base projects and, sometimes, on the efficiency of its internal operations—not on its procurement of energy from independently owned projects.

### *B. Wholesale Competition in Hawai'i*

Prior to 1978, electric utilities throughout the United States were vertically integrated monopolies, placing under one roof system planning, system engineering, power generation, power transmission, power distribution, and retail service provision—as the HECO Companies largely do even today.<sup>92</sup> Beginning with the Public Utility Regulatory Policies Act of 1978 (PURPA),<sup>93</sup> however, electricity markets in many areas were “restructured” to nurture competition in the wholesale generation sector, while paring back monopoly cost-of-service regulation to the transmission and distribution sectors, which were thought to be the only true natural monopoly segments of the vertical value chain.<sup>94</sup> Specifically, PURPA vertically integrated utilities to allow certain types of IPPs (small renewable and cogeneration facilities) to interconnect with and sell power to their local utility at the utility's avoided cost—at a price equal to the cost that the utility would incur if it were to itself generate the power supplied by the IPP.<sup>95</sup> PURPA gave birth to a new industry of unregulated IPPs,<sup>96</sup> but it did not furnish a stable paradigm for the new industry's interaction with the utility. Rather, the new competitors remained mere appendages to the traditional monopoly system, dependent on utilities for grid interconnection, and

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<http://puc.hawaii.gov/wp-content/uploads/2013/06/2008-0273.-Decoupling-Press-Release.20100831.pdf>.

91. In practice, of course, rate design is much more complex than this: there are different rates for different categories of customers, different levels of electricity usage, and, increasingly, different times of day. For the purposes of the incentives issues explored in this Article, however, the critical point is that the traditional cost of service model aims to set overall utility rates that provide the utility with its total revenue requirement, defined as its costs plus a reasonable rate of return on a subset of those costs.

92. See SEVERIN BORENSTEIN & JAMES BUSHNELL, *THE U.S. ELECTRICITY INDUSTRY AFTER 20 YEARS OF RESTRUCTURING I* (2015), <https://ei.haas.berkeley.edu/research/papers/WP252.pdf>.

93. 16 U.S.C. § 824 (2012).

94. BORENSTEIN & BUSHNELL, *supra* note 92, at 1.

95. Richard D. Cudahy, *PURPA: The Intersection of Competition and Regulatory Policy*, 16 ENERGY L.J. 419, 420 (1995). FERC's implementation of this rule foundered in the appellate courts, but was ultimately reinstated by the Supreme Court. HIRSH, *supra* note 81, at 93.

96. HIRSH, *supra* note 81, at 90–93.

compensated at a rate derived from the interconnecting utility's cost structure.<sup>97</sup> Such avoided cost determination was an inherently controversial exercise.<sup>98</sup> Utilities argued for methodologies that resulted in low avoided cost rates; IPPs argued for methodologies that resulted in high avoided cost rates.<sup>99</sup> In adjudicating these controversies, regulators found themselves drawn back to the traditional problems of cost-of-service regulation: the utilities are the only player with the information and resources to accurately understand the cost structure of their complex enterprise, but they have an incentive to portray those costs in a way that is advantageous to their investors.<sup>100</sup> Accordingly, it was not easy for regulators to determine where legitimate utility objections to IPP overcompensation ended and where anticompetitive conduct began.

In the early 1990s, Congress and FERC moved towards a more comprehensive embrace of market competition, with the goal of mooted these avoided cost controversies.<sup>101</sup> According to FERC, "[b]ecause many traditional vertically integrated utilities still did not provide open access to third parties and still favored their own generation if and when they provided transmission access to third parties, barriers continued to exist to cheaper, more efficient generation sources."<sup>102</sup> To eliminate these anticompetitive barriers, FERC promulgated its landmark Order No. 888,<sup>103</sup> and later its Order No. 2000.<sup>104</sup> As explained in more detail in Part III, below, Order No. 888 mandated the functional unbundling of transmission from generation, authorizing independent generators to wheel power to remote customers through utility transmission infrastructure. Order No. 2000 encouraged the fundamental restructuring of traditional vertical-integrated utilities, resulting in industry patterns more hospitable to competitive wholesale generation markets.

Hawai'i, however, differs from almost every other region of the United States in that its island electric grids are not subject to FERC's Federal Power Act jurisdiction, which extends only to wholesale transactions on electricity grids

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97. *Id.*

98. Timothy P. Duane, *Regulation's Rationale: Learning from the California Energy Crisis*, 19 YALE J. ON REG. 471, 487 (2002).

99. *Id.*

100. Cudahy, *supra* note 95, at 419–20, 425, 430–34; Paul L. Joskow & Roger G. Noll, *The Bell Doctrine: Applications in Telecommunications, Electricity, and Other Network Industries*, 51 STAN. L. REV. 1249, 1252–53 (1999). In Hawai'i, the PURPA rules were promulgated as Chapter 6-74 of the Hawai'i Administrative Rules. See HAW. CODE R. § 6-74 (LexisNexis 2018).

101. David B. Spence, *Can Law Manage Competitive Energy Markets?*, 93 CORNELL L. REV. 765, 773 n.40 (2007); HIRSH, *supra* note 81, at 120–24.

102. FERC, Order No. 888, Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities, 61 Fed. Reg. 21,540, 21,545 (May 10, 1996) [hereinafter Order 888]. See also Spence, *supra* note 101, at 773–74 (collecting citations to key related FERC orders).

103. Order 888, *supra* note 102, at 21,545.

104. FERC, Order No. 2000, Final Rule on Regional Transmission Organizations, 65 Fed. Reg. 810, 817–18 (Jan. 6, 2000) (codified at 18 C.F.R. § 35.34) [hereinafter Order 2000].

that cross state lines.<sup>105</sup> This means that FERC's orders did not obligate Hawai'i's utilities to eliminate anticompetitive favoritism of utility-owned generation. Nor did they require the Hawai'i PUC to restructure Hawai'i's electricity system. Rather, PURPA's IPP-as-utility-appendage model continued to prevail in Hawai'i, even as it was superseded in many other parts of the country by a more comprehensively reformed, stable model.

In the mid-2000s, the Hawai'i PUC considered the possibility of ordering restructuring on its own initiative, but rejected the idea, opting instead to issue an order known as the Competitive Bidding Framework (Framework).<sup>106</sup> The Framework provides that when a Hawai'i electric utility desires to procure new generation over a certain size threshold, the utility must hold a PUC-supervised competitive bidding proceeding,<sup>107</sup> into which both IPPs and the utility are allowed to bid for projects.<sup>108</sup> If an IPP is selected in such a proceeding, it enters into a long-term power purchase agreement with the utility, under which the IPP commits to build, own, operate, and maintain the proposed facility, and sell its output to the utility at the price it offered.<sup>109</sup> The Framework does not foreclose the possibility of the development of new generation by the utility, if it can do so at lower cost than IPPs. And it leaves the utility in charge of selecting projects (including the utility's own projects), determining the cost that must be charged to third-party projects for interconnection to the utility grid, and long-term planning of the types of projects required.<sup>110</sup>

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105. See, e.g., *New York v. FERC*, 535 U.S. 1, 23 (2002); Order 888, *supra* note 102, at 21,545 (noting that on the mainland “[p]hysically isolated systems have become a thing of the past”).

106. HAW. PUB. UTIL. COMM’N, DOCKET NO. 03-0372, DECISION AND ORDER NO. 23121, INSTITUTING A PROCEEDING TO INVESTIGATE COMPETITIVE BIDDING FOR NEW GENERATING CAPACITY IN HAWAII EX. A (Dec. 8, 2006) [hereinafter Competitive Bidding Framework]. For similar rules in other jurisdictions, see HAW. PUB. UTIL. COMM’N, DOCKET NO. 03-0372, STATEMENT OF POSITION OF HAWAIIAN ELECTRIC COMPANIES EX. E (Mar. 14, 2005) (summarizing results of a fifty-state survey of competitive bidding rules as of 2005); ARIZ. ADMIN. CODE § R14-2-705 (2018); 52 PA. CODE § 57.34 (1995); OR. PUB. UTIL. COMM’N, ORDER NO. 06-446, DISPOSITION: GUIDELINES ACCEPTED, IN THE MATTER OF AN INVESTIGATION REGARDING COMPETITIVE BIDDING (2006).

107. However, most of the IPP projects have been developed under waivers of the specific rules imposed by the Framework, rather than under fully Framework-compliant bidding procedures. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2012-0077, SUNEDISON UTILITY HOLDING, INC.’S MOTION TO INTERVENE EX. A 4–5 (June 4, 2015) (calculating that between the adoption of the Competitive Bidding Framework and 2015, only two projects had been selected vis Framework-compliant RFPs, with all of the rest (more than fifteen projects) selected pursuant to waivers). The Competitive Bidding Framework thus functions more as a “background threat” and constraint on utility self-favoritism than an actual procedural roadmap for procurement.

108. See Competitive Bidding Framework, *supra* note 106, at 3–6. As a practical matter, however, the Framework appears to have gone a long way towards frustrating the investment by the HECO Companies in new utility-owned generation: virtually all of the above-described large-scale attempts to develop transformative renewable energy projects came from IPPs.

109. See *id.* at 17.

110. See Competitive Bidding Framework, *supra* note 106.

The Framework thus is best understood as an incremental evolution of PURPA's "many-to-one" or "single buyer" wholesale market model.<sup>111</sup> Under the Framework, the fundamental structural relation between the utility and IPPs remains the same as under PURPA: the utility continues to plan, own, and operate the electricity system as a whole, dispatching all generation on the system (whether utility-owned or IPP-owned) to meet electricity demand, and determining when and where new generation capacity is needed. The principal difference is the way the wholesale rate is determined. Where PURPA required the utility to purchase electricity from IPPs at the regulated utility's avoided cost, the Framework requires the utility to purchase electricity at a price that is both attractive relative to the utility's avoided cost *and* competitive.<sup>112</sup>

### C. Net Energy Metering and Rooftop Solar Policy

In 2001, Hawai'i added still another layer to its energy regulatory framework by enacting a law that requires utilities to offer net energy metering (NEM).<sup>113</sup> Hawai'i's NEM law, like the similar laws that have been enacted in most other states, requires utilities to grant customers with rooftop solar or other "distributed generation" equipment bill credit for excess energy the customer sends to the utility.<sup>114</sup> In other words, NEM allows customers to spin their meter backward as they export excess rooftop solar energy to the grid. Without NEM (or a similar export policy), rooftop solar equipment would be useful only for reducing customers' daytime purchases of utility energy. Rooftop solar systems would therefore be limited in size, and customers would still pay significant utility electricity bills for their nighttime use. With NEM, rooftop solar equipment can be sized to produce more than the customers need during the daytime, generating bill credit that zeroes out the bills the customer would otherwise owe for nighttime electricity. For that reason, NEM played a key role in the success of the rooftop solar industry in Hawai'i and nationwide.<sup>115</sup>

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111. In the early 1990s, the Federal Energy Regulatory Commission cleared the way for the use of competition to determine PURPA avoided cost by approving the use of competitive bidding by state regulators as a means to determine the "avoided cost" to which IPPs were entitled under PURPA. In re Southern California Edison Co., 70 FERC ¶ 61,215, at ¶ 61,676 (FERC Feb. 22, 1995), clarified by *Order Granting Clarification and Dismissing Rehearing*, 133 FERC ¶ 61,059 (Oct. 21, 2010); In re North Little Rock Cogeneration, L.P., 72 FERC ¶ 61,263 (Sept. 19, 1995).

112. See Competitive Bidding Framework, *supra* note 106. At least in theory, the Framework reduces the need for regulators to evaluate the reasonableness of the price based on "cost-plus" regulatory principles, allowing competition rather than regulation to set wholesale prices. In practice, however, the utility requests PUC approval of the projects it competitively selects in a formal PUC proceeding, in which the PUC compares the utility's avoided cost baseline to the estimated cost to the utility of purchasing the IPP's power under the proposed agreement. See, e.g., the examples described *infra* Part II.C.

113. HAW. REV. STAT. § 269-101 (2015).

114. Heather Payne, *A Tale of Two Solar Installations: How Electricity Regulations Impact Distributed Generation*, 38 U. HAW. L. REV. 135, 145 (2016).

115. There were, of course, other contributors to NEM's grid parity, including rapid declines in the cost of solar equipment, tax incentives, and business model innovations that allowed consumers to buy



NEM can be understood as the twenty-first century, distribution-system analogue to PURPA. Like PURPA, NEM forces utilities to purchase power at a rate based on the utility's cost structure. Just as PURPA's forced-purchase requirement gave rise to a new industry of IPPs, NEM gave rise to a new rooftop solar industry, which installed more than 500 MW of renewable capacity in Hawai'i over the last several years, increasing renewables' share of total generation by 8 percent.<sup>116</sup> At the same time, however, NEM gave rise to controversial policy questions about the rates that the utility was forced to pay to the new category of "prosumers," which—like PURPA IPPs before them—both compete with and depend on the utility.<sup>117</sup> Utilities argue that rooftop solar owners should be credited for rooftop solar exports at a rate that approximates the utilities' cost to procure wholesale power; the rooftop solar industry defends the reasonableness of NEM's retail price-based crediting model.<sup>118</sup> Similarly, utilities argue that their grids cannot physically absorb the uncontrolled growth of rooftop solar; rooftop solar advocates disagree.<sup>119</sup>

In 2015, the PUC issued a decisive order siding with the utilities on the most important of these questions.<sup>120</sup> The 2015 order made Hawai'i one of the first states to end NEM, replacing it with a wholesale cost-based export credit rate, and capping the total amount of export-eligible NEM.<sup>121</sup> The cap was promptly reached, such that new rooftop solar customers in Hawai'i can only install no-export systems, which must either be sized smaller to serve only the customer's daytime load, or include expensive batteries to store daytime generation for nighttime use.<sup>122</sup> These reforms made the economics of rooftop solar

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"zero money down" solar. *See generally* MIT, THE FUTURE OF SOLAR ENERGY: AN INTERDISCIPLINARY MIT STUDY (2015), [https://mitei.mit.edu/system/files/MIT%20Future%20of%20Solar%20Energy%20Study\\_compressed.pdf](https://mitei.mit.edu/system/files/MIT%20Future%20of%20Solar%20Energy%20Study_compressed.pdf); DAVID FELDMAN ET AL., U.S DEP'T. OF ENERGY SUNSHOT INITIATIVE, PHOTOVOLTAIC SYSTEM PRICING TRENDS: HISTORICAL, RECENT, AND NEAR-TERM PROJECTIONS (Sept. 22, 2014), <http://www.nrel.gov/docs/fy14osti/62558.pdf>; ROCKY MOUNTAIN INST., THE ECONOMICS OF GRID DEFLECTION 6–9 (2014), [http://www.rmi.org/electricity\\_grid\\_deflection](http://www.rmi.org/electricity_grid_deflection).

116. *See supra* Figure 5.

117. Payne, *supra* note 114, at 158–165; PAUL DE MARTINI & LORENZO KRISTOV, DISTRIBUTION SYSTEMS IN A HIGH DISTRIBUTED ENERGY RESOURCES FUTURE V (2015), <http://eta-publications.lbl.gov/sites/default/files/lbnl-1003797.pdf>.

118. FRANCISCO FLORES-ESPINO, NAT. RENEWABLE ENERGY LAB., COMPENSATION FOR DISTRIBUTED SOLAR: A SURVEY OF OPTIONS TO PRESERVE STAKEHOLDER VALUE 9, 15–18 (2015), <http://www.nrel.gov/docs/fy15osti/62371.pdf>.

119. PAUL SHEAFFER, REGULATORY ASSISTANCE PROJECT, INTERCONNECTION OF DISTRIBUTED GENERATION TO UTILITY SYSTEMS: RECOMMENDATIONS FOR TECHNICAL REQUIREMENTS, PROCEDURES AND AGREEMENTS, AND EMERGING ISSUES 11 (2011), <http://www.raonline.org/wp-content/uploads/2016/05/rap-sheaffer-interconnectionofdistributedgeneration-2011-09.pdf>.

120. HAW. PUB. UTIL. COMM'N, DOCKET. NO. 2014-0192, DECISION AND ORDER NO. 33258, IN RE PROCEEDING TO INVESTIGATE DISTRIBUTED ENERGY RESOURCE POLICIES (2015).

121. *Id.*

122. *See Net Energy Metering*, HAWAIIAN ELEC. CO., <https://www.hawaiielectric.com/products-and-services/customer-renewable-programs/net-energy-metering> (last visited Nov. 9, 2018); *Net Energy Metering Plus*, HAWAIIAN ELEC. CO., <https://www.hawaiielectric.com/products-and-services/customer-renewable-programs/net-energy-metering-plus> (last visited Nov. 9, 2018).

significantly less favorable to homeowners. As a result, the rooftop solar industry contracted by more than 50 percent between 2016 and 2017, and is now less than 25 percent of its 2012 all-time peak.<sup>123</sup>

PURPA, the Framework, NEM, and the possible post-NEM distributed energy resource compensation frameworks all belong to a single category: they are policies that encourage competition between utilities and non-utility actors for the ownership of electricity generation, while leaving the non-utility actors dependent on the utilities for transmission, distribution, and system planning.

*D. The “Stalemate” Explanation for Slow Progress on Hawai‘i’s Renewable Energy Transformation.*

With that background in place, we can finally explain the last decade’s slow progress towards a renewable transformation: the fundamental problem is the tension inherent in Hawai‘i’s hybridization of the traditional cost-of-service model with the wholesale competition model. The utility retains an incentive to develop generation: that is the way that utility investors earn a return on the new capital they deploy. However, the utility is discouraged from developing generation by the Framework, which gives IPPs an opportunity to compete for any project it proposes. Additionally, the PUC’s explicit (if informal) guidance over the last decade has consistently exhorted the utility to embrace the development of new generation by IPPs and—until recently—the rooftop solar industry. Yet as long as the utility holds out hope of developing utility-owned projects instead, it will be at best lukewarm towards non-utility-owned projects, and at worst actively hostile. The success of such projects reduces the utility’s ability to deploy capital in alternative utility-owned projects. The result is that both the utility and non-utility investors want to develop renewable energy projects, but neither the utility nor the other interested parties have the power necessary to actually bring projects to completion, only to frustrate their competitors’ projects.

*1. Utility Project Failures*

As a consequence of this legal regime, over the last decade utilities have seldom dared to open competitive proceedings for large-scale renewable projects that could be won by IPPs. Instead, the utility has focused on various ways of attempting to profitably deploy capital without triggering the Framework, and even in these initiatives, it has typically been thwarted by the PUC.

For example, between 2007 and 2011, the HECO Companies worked on plans for the large-scale fuel-switching of their existing units from fossil fuels to biofuels.<sup>124</sup> This would have allowed the utilities to decarbonize by reinvesting

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123. Marco Mangelsdorf, *The New Normal for Rooftop Solar in Hawaii?*, GREENTECH MEDIA (July 14, 2017), <https://www.greentechmedia.com/articles/read/the-new-normal-for-rooftop-solar-in-hawaii>.

124. See HAWAIIAN ELEC. CO., BIOFUELS TRANSITION STRATEGY 1–15 (Oct. 27, 2006).

in their existing utility-owned fleet of power plants, without triggering the Framework.<sup>125</sup> However, the PUC rejected the first two major proposed biofuels contracts on the grounds that their pricing was higher than alternatives like wind and solar.<sup>126</sup> A third major biofuel supply project was rejected by the utility, resulting in federal court litigation between the utility and the project developer.<sup>127</sup>

In 2013, HECO asked the PUC for a waiver of the Framework in order to develop a ~15 MW solar farm at an existing utility facility.<sup>128</sup> However, the PUC declined to grant the waiver, concluding that the utility should use competitive bidding instead.<sup>129</sup>

In late 2014, HEI announced that it had agreed to be acquired by NextEra, a large mainland conglomerate that owns an efficient vertically integrated utility (Florida Power & Light), numerous IPPs in other areas of the United States, and natural gas interests.<sup>130</sup> NextEra and the HECO Companies argued that the acquisition would allow the HECO Companies to better fund, manage, and execute the clean energy transformation.<sup>131</sup> However, the PUC rejected the proposed acquisition,<sup>132</sup> in part due to fears that NextEra's strategy was to execute the transformation by developing utility- or utility affiliate-owned infrastructure, rather than by doing business with IPPs.<sup>133</sup> As the PUC put it, NextEra and HEI "have not provided a sufficiently detailed set of conditions that will ensure, to the greatest extent possible, robust competition in Hawai'i's

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125. *Id.* Even better, the large-scale cultivation of energy crops would revitalize Hawai'i's ailing plantation agriculture sector—a politically popular objective. HAW. DEP'T OF BUS., ECON. DEV. & TOURISM, THE POTENTIAL FOR BIOFUELS PRODUCTION IN HAWAII 7-11 (Jan. 2010), <https://energy.hawaii.gov/wp-content/uploads/2011/10/Hawaii-Biofuels-Assessment-Report.pdf>.

126. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2011-0005, ORDER NO. 32053, DECISION AND ORDER 2-3 (Sept. 29, 2011) (denying the proposed biofuel contract); HAW. PUB. UTIL. COMM'N, DOCKET NO. 2012-0185, ORDER NO. 32053, DECISION AND ORDER NO. 31759 1-3 (Dec. 23, 2013) (denying a revised version of the same proposed contract).

127. *BlueEarth Biofuels, LLC v. Hawaiian Elec. Co.*, 235 P.3d 310, 311 (Haw. 2010). Hawai'i's utilities are now purchasing small amounts of biodiesel from other suppliers, but excitement about basing a large-scale renewable transformation on biodiesel has waned. *See* Diane Cardwell, *Biofuels Plant in Hawaii Is First to Be Certified as Sustainable*, N.Y. TIMES (May 13, 2016), <https://www.nytimes.com/2016/05/14/business/energy-environment/biofuels-plant-in-hawaii-is-first-to-be-certified-as-sustainable.html>.

128. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2013-0360, DECISION & ORDER NO. 32437 (Nov. 6, 2014).

129. *Id.* at 1–2.

130. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2015-0022, APPLICATION (Dec. 3, 2014).

131. As one participant put it, the acquisition was a "corporate transformation designed to facilitate the system transformation" required by Hawai'i's renewable energy policy. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2015-0022, PANIOLo POWER COMPANY, LLC MOTION TO CONSOLIDATE 2 (Mar. 9, 2015).

132. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2015-0022, ORDER NO. 33795, DISMISSING APPLICATION AND CLOSING DOCKET (July 15, 2016).

133. *Id.* at 9.

energy markets” or explained “how the competitive processes they envision will be fair to all bidders.”<sup>134</sup>

In 2014 and 2015, in conjunction with the NextEra acquisition plan, the HECO Companies pursued plans to develop large-scale liquefied natural gas import and regasification infrastructure.<sup>135</sup> The utilities promoted the liquefied natural gas (LNG) concept as a lower-cost, slightly cleaner “bridge fuel” that could ease the transition from the present oil-heavy portfolio to a fully renewable system.<sup>136</sup> Like the earlier biofuel concept, the LNG plan would allow the utilities to reinvest in existing assets, rather than opening competitive bidding for new renewable plants.<sup>137</sup> However, Governor David Ige (who controls appointments to the PUC) publicly opposed the plan, preferring an immediate transformation to renewables, with no intervening “bridge.”<sup>138</sup> After the failure of the NextEra transaction, the HECO Companies withdrew their LNG requests.<sup>139</sup>

In 2016, HELCO asked the PUC for approval to purchase an existing IPP-owned, fossil-fueled plant (Hamakua Energy Partners), and add the investment to its rate base.<sup>140</sup> HELCO argued that the purchase should not trigger the Framework, because the plant was not “new,” but only “new to the utility.”<sup>141</sup>

134. The politics of this decision were splashed across the headlines for months thereafter, involving an unfiled ethics complaint by one commissioner against another, a legal challenge to the governor’s use of his appointments power to replace a commissioner who may have supported NextEra, and the legislature’s eventual decision not to confirm the new commissioner. See Robert Walton, *Hawaii Court Upholds Appointment of PUC Regulator Thomas Gorak*, UTILITY DIVE (Aug. 30, 2016), <https://www.utilitydive.com/news/hawaii-court-upholds-appointment-of-puc-regulator-thomas-gorak/425375/>; Kathryn Mykleseth, *Senators Reject Governor’s PUC Nominee*, HONOLULU STAR-ADVERTISER (Apr. 29, 2017), <http://www.staradvertiser.com/2017/04/29/hawaii-news/senators-reject-governors-puc-nominee/>.

135. Applications for approval of utility-owned LNG infrastructure were filed in various PUC proceedings. See HAW. PUB. UTIL. COMM’N, DOCKET NO. 2016-0135, APPLICATION OF HAWAIIAN ELECTRIC COMPANY, INC., HAWAI’I ELECTRIC LIGHT COMPANY, INC., AND MAUI ELECTRIC COMPANY, LIMITED (May 18, 2016); HAW. PUB. UTIL. COMM’N, DOCKET NO. 2016-0136, HAWAIIAN ELECTRIC APPLICATION (May 18, 2016); HAW. PUB. UTIL. COMM’N, DOCKET NO. 2016-0137, HAWAIIAN ELECTRIC APPLICATION (May 18, 2016). Corresponding revisions were made to the resource plans filed by the HECO Companies in 2014. These plans were conditioned on the PUC’s approval of the NextEra acquisition. See generally HAW. PUB. UTIL. COMM’N, DOCKET NO. 2014-0183.

136. See sources cited *supra* note 135.

137. See sources cited *supra* note 135. Hawai’i Gas, Hawai’i’s natural gas utility, also sought to develop LNG infrastructure and to use it to supply the electric utilities; however, the electric utilities preferred to control the infrastructure development process. See Duane Shimogawa, *Hawaii Gas to Build Infrastructure for LNG Expansion Project*, PAC. BUS. NEWS (Mar. 16, 2017), <https://www.bizjournals.com/pacific/news/2017/03/16/hawaii-gas-to-build-infrastructure-for-lng.html>.

138. Kathryn Mykleseth, *Gov. David Ige Opposes Use of Liquefied Natural Gas*, HONOLULU STAR-ADVERTISER (Aug. 24, 2015), <http://www.staradvertiser.com/2015/08/24/breaking-news/gov-david-ige-opposes-use-of-liquefied-natural-gas-2/>.

139. Gavin Bade, *Hawaiian Electric Says it is Not for Sale, Withdraws LNG Import Proposal*, UTILITY DIVE (July 20, 2016), <https://www.utilitydive.com/news/hawaiian-electric-says-it-is-not-for-sale-withdraws-lng-import-proposal/422958/>.

140. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2016-0033, DECISION AND ORDER NO. 34536 (May 4, 2017).

141. *Id.*

The PUC rejected the proposal, ordering HELCO to focus on the integration of renewable energy into its system, rather than fossil-fuel investments.<sup>142</sup> The HECO Companies, however, were undeterred. They announced that they would instead purchase the plant through an unregulated affiliate.<sup>143</sup> This purchase, they told investors, would be the first in an “enterprise-wide strategy to develop and invest in opportunities” to own generation.<sup>144</sup>

## 2. IPP Project Failures

The last decade has also been characterized by the failure of the most ambitious non-utility initiatives, often amid contentious disputes with the utility. Between 2008 and 2013, two of Hawai‘i’s largest traditional landowners promoted plans to develop 400 MW of wind generation on their former agricultural lands on Lāna‘i and Moloka‘i, along with interisland cable infrastructure to transmit the energy to the population center on O‘ahu.<sup>145</sup> These plans were the subject of at least five separate PUC proceedings, state legislation, and millions of dollars of investment by project developers.<sup>146</sup> However, the plans bogged down amidst community opposition and lukewarm economic analyses by HECO of the value of interisland cables.<sup>147</sup> The PUC never reached a decision on whether interisland cables would be in the public interest, and the concept now appears to be abandoned.<sup>148</sup>

In 2013, apparently at the PUC’s behest, HECO opened a streamlined competitive solicitation for “shovel ready” renewable energy projects. It selected eleven projects capable of producing an aggregate total of 264 MW of renewable capacity.<sup>149</sup> HECO originally planned to negotiate executed power purchase agreements and submit them to the PUC within eleven months of the results of competitive bidding.<sup>150</sup> However, after selection of the projects, HECO began to

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142. *Id.*

143. The strategy was disclosed on an HEI earnings call. *See Hawaiian Electric Industries’ (HE) CEO Connie Lau on Q3 2017 Results - Earnings Call Transcript*, SEEKING ALPHA (Nov. 2, 2017), <https://seekingalpha.com/article/4119904-hawaiian-electric-industries-ceo-connie-lau-q3-2017-results-earnings-call-transcript>.

144. *Id.*

145. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2013-0168, CASTLE & COOKE PROPERTIES, INC.’S WRITTEN STATEMENT SPECIFYING IN DETAIL THE STATUS OF THE LANAI WIND PROJECT AND ADDRESSING UNCERTAINTY CREATED AS A RESULT OF THE LANAI TRANSACTION 3-4, 12–15 (Aug. 28, 2013) (summarizing the history of the project and collecting citations).

146. *Id.*

147. *Id.*

148. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2013-0168, ORDER NO. 34756 CLOSING THE DOCKET 5 (Aug. 15, 2017); HAW. PUB. UTIL. COMM’N, DOCKET. NO. 2013-0169 (Aug. 15, 2017).

149. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2013-0156, HECO’S APPLICATION FOR WAIVERS (June 18, 2013) (showing the selection of five projects for 64 MW); HAW. PUB. UTIL. COMM’N, DOCKET. NO. 2013-0381, HECO’S APPLICATION FOR ADDITIONAL WAIVERS 14-15 (Nov. 4, 2013) (showing the selection of an additional six projects for 210 MW).

150. HAW. PUB. UTIL. COMM’N, DOCKET. NOS. 2014-0356, 2014-0357, 2014-0359, KAWAIILOA SOLAR, LLC, LANIKUHANA SOLAR LLC, AND WAIPIO PV, LLC’S RESPONSE TO ORDER NOS. 33517,

question whether there would be sufficient “room” on its system for all of the projects’ renewable energy, given the rapid growth of rooftop solar on its system.<sup>151</sup> As a result of these concerns, power purchase agreement negotiations and interconnection studies dragged on for twenty-one months, followed by an additional seven-month PUC approval process.<sup>152</sup> In other words, it took nearly two-and-a-half years from the date of project proposals for the “streamlined” process to determine whether or not to greenlight the projects.<sup>153</sup> Four of the eleven selected projects elected to drop out of this process before it was complete.<sup>154</sup>

When HECO finally submitted its executed power purchase agreements with the remaining seven selected projects to the PUC for review, it continued to raise concerns about its ability to use all of the projects’ energy.<sup>155</sup> These concerns called into question the attractiveness of the projects’ pricing, since if the projects were not fully utilized, customers would end up paying higher rates on a per-kWh basis.<sup>156</sup> In its orders, the PUC criticized “HECO’s failure to build a sufficient record in these dockets,” speculating that “[i]f HECO had proposed to invest in new utility owned generation resources of this magnitude, the commission seriously questions whether such a project would have received such superficial and deficient treatment.”<sup>157</sup> Nevertheless, the PUC ultimately endorsed the utility’s fear of overcapacity, denying three of the surviving competitively selected projects, in order to ensure full utilization of the remaining four.<sup>158</sup>

By the time the PUC issued its approvals, however, the owner of three of those four surviving projects was in financial trouble.<sup>159</sup> HECO terminated the projects based on fears of bankruptcy.<sup>160</sup> The developer cried foul, arguing that HECO had pushed the projects into default by unreasonably refusing to allow the transfer of the projects from the troubled developer to a creditworthy buyer.<sup>161</sup> The PUC eventually issued a staff report again criticizing HECO’s conduct. It concluded that “HECO did not aggressively pursue available options

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33518, AND 33519 INSTRUCTING HAWAIIAN ELECTRIC COMPANY, INC. TO FILE A STATUS REPORT AND PERMITTING REPLY COMMENTS EX. 8, 3–4 (Feb. 25, 2016) [hereinafter SunEdison Brief].

151. *Id.*

152. *Id.* at 8.

153. The main reason for the delay was that after HECO’s selection of the projects, the utility raised questions about whether its grid could accept all of the solar energy it had selected, especially in light of the “duck curve” phenomenon caused by the contemporaneous growth of rooftop solar. *See id.* at Fig. 2. That issue led to a lengthy negotiation between the selected IPPs and the utility regarding whether the economic risk of project underutilization (known as “curtailment”) should be allocated investors, utility customers, or project owners. *Id.* at 10.

154. *Id.*

155. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2014-0356, ORDER NO. 32875 4 (June 2, 2015).

156. *Id.*

157. *Id.*

158. SunEdison Brief, *supra* note 150, at 9.

159. *Id.* at 10–11, 13.

160. *Id.* at 34–35.

161. *Id.* at 19–21, 64.

for completing the three Projects on a timely basis,” and that “HECO’s efforts were instead directed towards terminating the PPAs.”<sup>162</sup> By the time that guidance was issued, however, the developer and its three projects had already slid into bankruptcy, taking the projects with it.<sup>163</sup> Ultimately, therefore, ten of the eleven projects originally selected during the competitive proceeding failed for one reason or another, resulting in the downgrade of the selected 274 MW of renewable capacity to just 27.6 MW of capacity.<sup>164</sup>

Between 2012 and 2016, HELCO ran a competitive request for proposal (RFP) to procure up to an additional 50 MW of geothermal generation on the Big Island.<sup>165</sup> It took three years from the opening of the process to the selection of a bidder, during which period the independent observer appointed by the PUC repeatedly criticized the process, ultimately concluding that it “was doomed before it even began by the utility’s poor resource planning.”<sup>166</sup> When a bidder was finally selected, it withdrew from post-bidding negotiations, stating that the terms demanded by the utility were impossible for the IPP to agree to.<sup>167</sup> A losing bidder filed a formal complaint with the PUC, alleging that HELCO conducted the RFP process “without a good faith intent to purchase any geothermal energy,” and that its conduct throughout was “unfair, improper, negligent, and/or [in] bad faith.”<sup>168</sup>

In 2012, HELCO executed a power purchase agreement with a biomass IPP for the refurbishment of a former sugar-industry power plant, which had previously burned bagasse (cellulosic sugar cane waste), and which the IPP now proposed to fuel with Eucalyptus logs from sustainable, local tree plantations.<sup>169</sup>

162. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2014-0357, COMMISSION STAFF REPORT CONCERNING THE TERMINATION OF CERTAIN UTILITY SCALE SOLAR PROJECTS 2 (Apr. 12, 2016) [hereinafter Commission Staff Report].

163. Several years later, the projects were resurrected after their purchase by another developer, and are currently under development but not completed. See NRG Energy Breaks Ground on Three Hawaii Solar Projects, HAWAIIAN ELEC. CO. (Jan. 24, 2018), <https://www.hawaiianelectric.com/nrg-energy-breaks-ground-on-three-hawaii-solar-projects>.

164. See Commission Staff Report, *supra* note 162, at 5, 8. Also in 2013–2015, the PUC denied the twenty MW Mililani I project, and the fifteen MW Kahe PV project.

165. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2012-0092, ORDER NO. 30360 OPENING DOCKET (May 1, 2012). The effort was more significant than the 30 MW figure may suggest, because geothermal can provide a firm dispatchable source of renewable energy to complement intermittent renewables like wind and solar, potentially replacing the “must run” fossil fuel units. *Supra* Figures 3 and 4.

166. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2012-0092, THE INDEPENDENT OBSERVER’S REPORT ON THE RESULTS OF THE NEGOTIATION PHASE OF HAWAII ELECTRIC LIGHT COMPANY’S REQUEST FOR PROPOSALS FOR RENEWABLE GEOTHERMAL DISPATCHABLE ENERGY AND FIRM CAPACITY RESOURCES 4 (Feb. 19, 2016).

167. *Ormat Withdraws from Contract Negotiations to Provide 25 MW of Geothermal Energy*, W. HAW. TODAY (Feb. 11, 2016), <http://www.westhawaii.com/2016/02/11/hawaii-news/ormat-withdraws-from-contract-negotiations-to-provide-25mw-of-geothermal-energy/>.

168. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2016-0027, HU’ENA POWER INC.’S PETITION FOR DECLARATORY ORDER AND COMPLAINT 3, 47 (Feb. 9, 2016).

169. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2002-2012, HU HONUA BIOENERGY, LLC’S RESPONSE TO ORDER NO. 33516 INSTRUCTING HAWAII ELECTRIC LIGHT COMPANY, INC. TO FILE A

A power purchase agreement was executed and approved by the PUC, but after the IPP missed development milestones, HELCO terminated the agreement.<sup>170</sup> The developer of the project filed a complaint with the PUC<sup>171</sup> and an antitrust action in federal court, alleging that the utility was inappropriately using its monopoly over electricity transmission to attempt to exclude competitors in the electricity-generation market.<sup>172</sup> In 2017, the utility conditionally settled with the IPP, and the PUC approved an amendment of the original PPA, ending the two-and-a-half-year dispute and allowing work on the facility to continue.<sup>173</sup> The facility, however, remains incomplete.<sup>174</sup>

Distributed rooftop solar has been a bright spot relative to many of the other ambitious initiatives described above: it has succeeded in adding approximately 600 MW of renewable capacity to Hawai‘i’s grid since 2008—more than all of the utility-scale renewable capacity in Hawai‘i combined.<sup>175</sup> However, rooftop solar must also be included on this list of failed non-utility initiatives. As described above, since 2015, the PUC has agreed with the utility’s position that export-eligible rooftop solar is inefficient, issuing orders that resulted in a 50 percent contraction of the rooftop solar industry between 2016 and 2017.<sup>176</sup> The rooftop solar industry is now installing less than 25 percent of the capacity it installed during its all-time peak in 2012.<sup>177</sup>

### 3. *The Root Cause of Project Failure is Incentives*

From one perspective, the proximate causes of these various failures, slowdowns, and setbacks are diverse: a few initiatives were killed—perhaps—by overt utility hostility, but others were killed by IPP mismanagement, IPP overpricing, PUC decisions, or community opposition. In nearly every case, however, the immediate cause of project failure can be traced to the deeper root causes of the utility’s lack of enthusiasm for the project. To be successful, a large-scale renewable energy project must navigate numerous obstacles: it must negotiate favorable terms with landowners, overcome community opposition in land-use proceedings, persuade lenders and financiers that the project’s rates are high enough and its risk is low enough, and persuade the PUC that the project is a good deal for customers. Without enthusiastic support from the utility, these

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STATUS REPORT AND PERMITTING REPLY COMMENTS 5–6 (Feb. 23, 2016) [hereinafter HHB Status Report].

170. *Id.* at 8–20.

171. *Id.* at 21–22.

172. *Hu Honua Bioenergy, LLC v. Hawaiian Electric Industries*, No. 16-00634 JMS-KJM, 2018 WL 491780, at \*5 (D. Haw. Jan. 19, 2018). The IPP also made this point in its filings with the PUC. HHB Status Report, *supra* note 169, at 4 (“Put simply, HELCO wants to terminate Hu Honua in order to favor its own generation.”).

173. *Hu Honua Bioenergy*, 2018 WL 491780, at \*1.

174. *Id.* at \*1 n.3.

175. *See supra* Figure 1.

176. Mangelsdorf, *supra* note 123.

177. *Id.*



obstacles are nearly impossible to clear, because it is the selector of worthy IPP projects, the monopsony purchaser of the IPPs' electricity, the system planner, the system operator, and the interconnection authority. If the utility selects unattractive projects, moves slowly, or offers only tepid endorsements in government approval proceedings, the IPP is likely to succumb to one risk or another, even without overt hostility. The PUC put its finger on the issue in a much-cited white paper it released in 2014:

Utility-owned generation creates inherent financial conflicts that can complicate, and in some cases impede, development of independent (IPP) generation projects. This creates regulatory challenges for the Commission, as well as a public distrust about investor-owned utility motives. It is difficult to ascertain whether project development delays, contractual disputes with independent developers or utility reluctance to quickly embrace change are predicated upon legitimate technical reasons or driven by existing and future utility generation rate base investment concerns and traditional utility business practices.<sup>178</sup>

In fact, this same incentives problem taints not only failed IPP projects, but also successful ones. Since the utility simply passes IPPs' wholesale pricing through to its customers with no financial impact on the utility, it is difficult to have confidence that competitive procurement proceedings aggressively sought the lowest pricing possible. In 2014, HECO signed solar contracts with IPPs at prices of over \$0.15 per kWh while utilities on the mainland were contracting with similar IPPs at prices around \$0.05 per kWh.<sup>179</sup> In other words, by leaving the utility in control of managing competition, Hawai'i's electricity industry structure may allow the utility's weak cost-control incentives to infect the IPP market as well, allowing IPPs to get away with extracting high prices from Hawai'i customers.

Rooftop solar projects differ in many ways from large-scale renewable energy projects, but the core challenge is the same: it is difficult to ascertain whether slow utility interconnection procedures, utility fears about grid disruption, and utility arguments about inefficiency reflect legitimate reasons or are driven instead by utility hostility to competition. Depending on your point of view, for example, even the 2015 orders ending net energy metering can be read either as (i) a reasonable prune-back of an overgenerous subsidy or (ii) a utility-influenced anticompetitive strike against an upstart industry.

I do not mean to suggest that we should *blame* Hawai'i utilities for the setbacks of the last decade. To the contrary, the tendency of Hawai'i's energy-

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178. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2012-0036, DECISION AND ORDER 32052 EX. A P. 18 (Apr. 28, 2014) [hereinafter IRP Rejection Order].

179. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2014-0356, DECISION AND ORDER NO. 33036 7 (July 31, 2015); Eric Wesoff, *Austin Energy Switches from SunEdison to Recurrent for 5-Cent Solar*, GREENTECH MEDIA (May 16, 2014), <https://www.greentechmedia.com/articles/read/austin-energy-switches-from-sunedison-to-recurrent-for-5-cent-solar#gs.WPbUr=g>.

policy community to reflexively scapegoat utilities is unfair and unproductive.<sup>180</sup> If the farmer leaves the fox in charge of the henhouse, should we blame the result on the farmer or the fox? The fox is supposed to eat the chickens; that is its role in the ecosystem. In the same way, our regulated electricity system explicitly sets utilities up as for-profit, publicly traded companies, designed to obtain low-cost capital on public markets, and correspondingly obligated to maximize value for their shareholders. The part of the system that is supposed to align the utility's incentives with those of its customers is PUC regulation. If the utility acts in the interest of its shareholders but not in the interest of customers, that is a failure of the regulatory model, not of the utility. The real problem is that by layering competition requirements (the Framework and, until recently, NEM) on top of a vertically integrated, regulated utility model, the laws and rules that govern Hawai'i's electricity sector encourage non-utility actors to take the lead role in executing the clean energy transformation, but leave those non-utility actors dependent on a utility that has no interest in—and may be hostile to—the non-utility projects.

*E. Why PUC Exhortation, Chastisement, and Control Can't Solve the Incentives Problem*

The PUC's main response to this fundamental incentives conflict over the last decade has been to increase its direct control over the utility's decision making.<sup>181</sup> Specifically, utility regulation in Hawai'i has evolved away from the traditional *ex post facto* review of the prudence of utility investments and towards a more active, *ex ante* direction of utility decision making. However, this effort has not proven successful.

*1. Resource Planning*

A case in point is the frustrating cat-and-mouse game between the PUC and HECO that played out in the HECO Companies' resource planning proceedings between approximately 2012 and 2017. In Hawai'i, as in many other states, utilities are required to periodically undertake a multistakeholder, participatory planning process, the goal of which is to generate a long-term Integrated Resource Plan (IRP) to guide the utility's future investments.<sup>182</sup> The IRP process that began in 2012 was particularly important, as it had the potential to chart a roadmap for the renewable energy transformation. Between 2012 and 2014, the

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180. See, e.g., *HECO Draws Ire of Solar Industry*, HAW. NEWS NOW (Jan. 24, 2014), <http://www.hawaiinewsnow.com/story/24544422/rooftop-pv-enjoys-another-strong-year-in-hawaii>; Lisa Kubota, *State Raises Concerns About HECO Setbacks for Renewable Energy Projects*, HAW. NEWS NOW (Feb. 19, 2016), <http://www.hawaiinewsnow.com/story/31269537/hawaiian-electric-defends-actions-in-response-to-criticism-from-puc>.

181. As this Article went to press, however, the PUC was beginning to turn towards a new focus on incentives, as described in the discussion on performance-based ratemaking. See *infra* Part III.A.

182. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2012-0036, ORDER NO. 30233 INITIATING THE HECO COMPANIES' INTEGRATED RESOURCE PLANNING PROCESS (Mar. 1, 2012).

utilities met with stakeholders and used computer modeling software to simulate dozens of different potential future portfolios of grid resources.<sup>183</sup> However, most of the non-utility participants expressed dissatisfaction with the utilities' plans, and in April 2014, the PUC issued an order rejecting the final results of the process.<sup>184</sup> The PUC criticized the utilities' final IRP report, which presented a number of potential resource plans but did not rank or prioritize them, or even provide criteria on which they could be prioritized. In other words, the IRP process simply produced analysis, without subjecting that analysis to judgment or disclosing the utility's intended course of action.<sup>185</sup> In fact, the utilities took an "anti-plans" approach to utility planning: as the PUC put it, "the Action Plans appear to be focused on preserving 'flexibility' as the single predominant objective."<sup>186</sup>

As a replacement for the failed IRP, the PUC ordered a new "power supply improvement plan" (PSIP) process, in which utilities would conduct similar work, but would be more closely supervised by the PUC. In part to provide guidance for this new planning work, PUC attached to its IRP rejection order a white paper entitled "*Commission's Inclinations on the Future of Hawaii's Electric Utilities*."<sup>187</sup> The *Inclinations* white paper is comprehensive, touching on all of the main problems and themes of twenty-first century electricity policy. However, it is also abstract and general, to the point of platitude:

[Utilities should] cost-effectively upgrade the generation system to enable integration of renewables, which could include investments to improve the flexibility of existing generation and the addition of new units which have characteristics to accommodate substantial additional renewable energy in the future. However, these efforts must also utilize new tools, such [sic] energy storage, demand response, and other load management techniques, on an equivalent basis to traditional generation assets, which is consistent with a vision of an "Integrated Grid" of the future articulated by some industry analysts. Future resource plans for each island grid need to demonstrate the optimal mix of existing and new resources to meet operational needs efficiently and cost-effectively.<sup>188</sup>

It was necessarily left to the utilities themselves to decide how to implement this laundry list of desirable objectives, and how to prioritize among the numerous identified project categories, tools, and resources.

Over the next two years, from 2014 to 2016, the utility conducted extensive further modelling and analyses. It produced a new resource plan in August

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183. *Id.*

184. IRP Rejection Order, *supra* note 178.

185. *Id.* at 32–33.

186. *Id.* at 37.

187. *Id.* at Ex. A [hereinafter *Commission's Inclinations*].

188. *Id.* at Ex. A, p. 6.

2014,<sup>189</sup> which was rejected by the PUC<sup>190</sup>. These plans, unlike the final IRP results, did identify a “preferred plan.”<sup>191</sup> However, the PUC concluded that the utilities had failed to select this plan using “a transparent, well-defined and reproducible approach.”<sup>192</sup> Specifically, rather than using “an optimizing capacity expansion model . . . according to standard, documented, and vetted methods,” the utilities had set up the analysis in a way that favored their preferred outcome, which in this case was LNG infrastructure.<sup>193</sup>

Finally, in December 2016, the HECO Companies submitted a third attempt at a plan.<sup>194</sup> In this version, the utilities obeyed the PUC’s instruction to use optimization techniques.<sup>195</sup> However, the utilities also reverted to the “anti-plan” approach they had advocated in their 2012 IRP plans, asserting the need for flexibility and refusing to commit to anything beyond a few short-term, largely business-as-usual steps that could be taken by the utility within the next five years.<sup>196</sup> The PUC accepted the plan in 2017,<sup>197</sup> but in the context of the PUC’s five-year effort to exhort the utilities to articulate a long-term plan for the renewable transformation, this move was as much a surrender by the PUC as a victory.<sup>198</sup>

The frustrating interaction between the PUC and the HECO Companies over resource planning is an illustration of the well-known principal-agent problem. The principal (in this case the PUC) is nominally in charge, but the agent (HECO) has the superior information and resources necessary to execute the command. Accordingly, the agent tends to have significant power to adopt the course of action it prefers, either by practicing selective obedience,

189. *See generally* HAW. PUB. UTIL. COMM’N, DOCKET NO. 2011-0206, HAWAIIAN ELECTRIC POWER SUPPLY IMPROVEMENT PLAN (Aug. 26, 2014); HAW. PUB. UTIL. COMM’N, DOCKET NO. 2011-0902, MAUI ELECTRIC POWER SUPPLY IMPROVEMENT PLAN (Aug. 26, 2014); HAW. PUB. UTIL. COMM’N, DOCKET NO. 2012-0212, HAWAII ELECTRIC LIGHT POWER SUPPLY IMPROVEMENT PLAN (Aug. 26, 2014).

190. *See* HAW. PUB. UTIL. COMM’N, DOCKET NO. 2014-0183, ORDER ADMITTING INTERVENORS AND PARTICIPANTS, IDENTIFYING OBSERVATIONS AND CONCERNS, SPECIFYING INITIAL STATEMENT OF ISSUES, AND ESTABLISHING SCHEDULE OF PROCEEDINGS 2–3 (Nov. 4, 2015).

191. *See id.* at 4.

192. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2014-0183, ORDER ESTABLISHING A PROCEDURAL SCHEDULE FOR THE HAWAIIAN ELECTRIC COMPANIES’ POWER SUPPLY IMPROVEMENT PLAN UPDATE 22 (Aug. 16, 2016).

193. *Id.*

194. December 2016 PSIP, *supra* note 40.

195. Some commentators, however, continued to allege that those techniques were set up in a way that guaranteed the utility’s preferred outcome. *Id.*

196. December 2016 PSIP, *supra* note 40, at ES-2, ES-7; *see* Herman K. Trabish, *Love the One You’re With: Hawaii Regulators Begrudgingly Accept HECO Energy Plan*, UTILITY DIVE (July 27, 2017), <https://www.utilitydive.com/news/love-the-one-youre-with-hawaii-regulators-begrudgingly-accept-heco-energy/447659/>.

197. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2014-0183, ORDER NO. 34696 1-3 (2017).

198. Among other problems, there remains a great deal of uncertainty about the viability of the optimal plans submitted but not endorsed by the utilities during the PSIP process. The optimized plans postpone much of the progress to 100 percent renewables until the eve of the 2045 deadline, when the utilities say that massive investments in new renewable projects will achieve the 100 percent renewable mandate. It seems dubious that this is a sound practical road to 100 percent renewables.

persuading the principal to adopt the agent's preference, or filling in the gaps in the principal's high-level instructions with the agent's own preferences. In the case of regulation, the principal-agent problem is exacerbated by the fact that the principals are located "outside" the agent organization. Thus, in the PSIP docket, the utilities superficially obeyed the PUC's commands, generating new documents that reflected the letter of PUC's preferences, but they never really obeyed the spirit of the PUC's command to articulate and commit to a plan for a renewable energy transformation.<sup>199</sup> In the resulting five-year standoff, the PUC blinked first.

## 2. Rooftop Solar Policy

The PUC's policymaking on rooftop solar suffers from a related problem. Specifically, the above-described 2015 effort to end NEM and limit future rooftop solar exports seems to be based on the premise that the regulatory system is effective at aligning the utility's incentives with those of its customers. If that premise is true, a homeowner who decides to "go solar" in Hawai'i does not thereby reduce fossil fuel consumption. Solar is the low-cost resource for Hawai'i's utilities as well as for Hawai'i's homeowners,<sup>200</sup> so a rational, properly incentivized utility would procure the maximum feasible amount of generation from utility-scale solar farms, subject to grid stabilization constraints.<sup>201</sup> Any generation "room" on the grid that is occupied instead by the interconnection of rooftop solar therefore should reduce only the amount of utility-scale solar that can be procured, such that rooftop solar systems actually displace utility-scale solar generation, not fossil fuel generation, as illustrated in Figure 8.<sup>202</sup> If the utility-scale solar generation can be procured more cheaply than rooftop solar exports (taking into account land use considerations and other collateral matters), the rooftop solar exports are inefficient. From this perspective, it makes sense to end net energy metering and reset rooftop solar compensation rates to levels similar to utility-scale project developers, so that the market as a whole selects the most efficient type of solar.

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199. See sources cited *supra* note 196.

200. See *supra* Figure 7.

201. In fact, even after it bumped into the must-run minimum generation "floor" it needs to stabilize the grid, it would likely invest in batteries or other grid upgrades to lower that floor, up to the point that such investments succeed the cost differential between solar energy and fossil fuel energy.

202. This was made explicit in the PUC orders denying three utility-scale solar projects due to fears that continued growth of rooftop solar would prevent their utilization, as well as the PUC orders in the DERs docket, which speculate that Hawai'i's renewable energy goals may be achieved more cost-effectively through utility-scale projects than through favorable rooftop solar export tariffs.

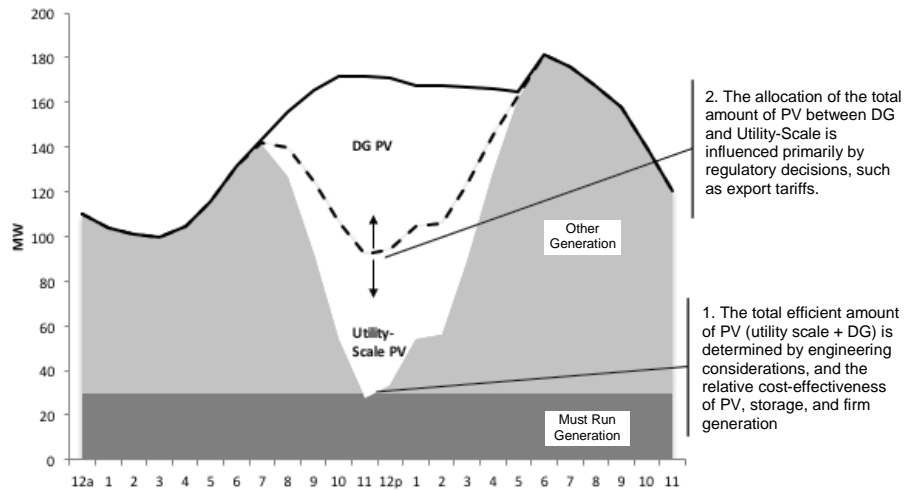


Figure 8: Conceptual Trade Off Between Rooftop and Utility-Scale Solar<sup>203</sup>

But that logic only holds if utilities actually act in their customers' interests to procure large amounts of low-cost utility-scale generation, which has not happened yet in Hawai'i. The real value of rooftop solar from an environmental perspective has been its ability to *force* renewable energy into the system, even in the face of utility resistance. Under the policies that prevailed until recently, exported rooftop solar energy had to be interconnected on request, and its electricity had to be accepted by the utility even before the utility's "must run" generators. The renewable energy forced onto the system may well be inefficient relative to a hypothetical world in which the utility executed the renewable energy transformation by contracting with numerous low-cost power plants. It is not, however, undesirable relative to the real-world baseline of imperfect regulation, in which the principal-agent problems prevent the PUC from effectively aligning utility action with its customers' interests and allow the utility to indefinitely postpone the clean energy revolution.

In short, the PUC's new rooftop solar policy aims to domesticate the wild world of rooftop solar by bringing it into the rational fold of cost-of-service regulation. But rooftop solar previously succeeded only because it had been insulated from the corrosive incentives problems endemic to such regulation, which doomed so many larger-scale IPP renewable energy projects. The PUC's rational, well-intentioned new policies therefore threaten to snuff out the only part of the electricity system that was actually making real progress towards the renewable energy transformation.

203. Created by the author.

### III. THREE OPTIONS FOR REFORMING UTILITY INCENTIVES IN HAWAII

In this final Part, I discuss policy interventions that might better target the root cause of the incentives problems diagnosed in the previous Part, allowing Hawaii to make good on its renewable ambitions. The major approaches to reforming problematic incentives in Hawaii's electricity system fall into three categories: (A) *performance-based ratemaking* works through utility compensation, attempting to set rates that incentivize utilities to take actions consistent with the public interest; (B) *restructuring* works through industry structure, breaking up utilities in a way that relieves utilities of the problematic incentives; and (C) *public control* works through governance, preserving the existing industry structure, but bringing monopoly utilities under direct public control. To date, attention in Hawaii has primarily focused on performance-based ratemaking and wheeling- or ISO-based restructuring. However, I argue that none of those interventions are good solutions for Hawaii's problems. Instead, Hawaii should explore TransCo-focused restructuring, or the transfer of investor-owned utilities to public control.

#### A. Performance-Based Ratemaking

Performance-based ratemaking is currently the leading candidate for incentives reform in Hawaii's electricity sector. Local renewable energy advocates have promoted performance-based schemes for several years, and both the Hawaii legislature and the PUC have recently taken steps to use performance-based rates to accelerate the adoption of renewable energy. However, I argue in this Subpart that performance-based ratemaking has important but underappreciated limitations, which will prevent it from furnishing an effective solution to the problems diagnosed below.

##### 1. Performance-Based Ratemaking Theory and History

Performance-based ratemaking was first popularized as a way of controlling utility costs, the core objective of traditional natural-monopoly price regulation.<sup>204</sup> In this application, performance-based regulation typically involves three steps:

First, the PBR [performance-based ratemaking] regulator must set a starting point or "baseline" revenue requirement. . . . Second, the PBR regulator must provide the utility managers with a package of incentives to encourage these managers to produce at a cost below this baseline. Operationally, this means designing a sharing mechanism to distribute any realized cost savings between ratepayers and shareholders. . . . Finally, the PBR regulator must include some type of "quality control" mechanism to insure that the utility

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204. Paul L. Joskow & Richard Schmalensee, *Incentive Regulation for Electric Utilities*, 4 YALE J. ON REG. 1, 6 (1986). See also Peter Navarro, *The Simple Analytics of Performance-Based Ratemaking: A Guide for the PBR Regulator*, 13 YALE J. ON REG. 105, 107 (1996).

does not pursue cost savings at the expense of system reliability, safety, customer satisfaction, or other measures of quality.<sup>205</sup>

Several such performance-based ratemaking experiments have been conducted in the United States since the 1990s, but the concept never gained much ground as a comprehensive replacement for traditional regulation.

Recently, interest has been rekindled in the use of performance-based ratemaking to encourage utilities to achieve goals distinct from cost minimization, such as interconnecting more renewable energy, or “playing nice” with distributed generation.<sup>206</sup> For example, as part of New York’s Reforming the Energy Vision proceeding, the New York Public Service Commission (PSC) issued an order that envisions the use of performance-based ratemaking “to create a modern regulatory model that challenges utilities to take actions to achieve these objectives by better aligning utility shareholder financial interest with consumer interest.”<sup>207</sup> In particular, targets will be set for utilities’ distributed energy resource interconnection performance—for example, time from application to interconnection. Utilities will have the opportunity to earn money by exceeding those targets, and to lose money by missing them.<sup>208</sup>

In the United Kingdom, where performance-based ratemaking has been used in some form for years, regulators have launched a comprehensive system of performance regulation known as “RIIO,” for “Revenue = Incentives + Innovation + Output.”<sup>209</sup> Each of the United Kingdom’s electricity-distribution and transmission-network operators must produce a “business plan,” which is a “massive regulatory filing and financial modeling effort” that “typically reach[es] into many hundreds of pages, with detailed cost, budget, and process information.”<sup>210</sup> The regulator then uses a negotiated, multistakeholder process to produce a set of metrics and compensation formulas based on the business plan, including not only financial-performance metrics, but also metrics for goals like customer satisfaction. All of this takes an average of approximately two-and-a-half years. The company’s rates are then automatically readjusted over the next eight years based on how well the company performs against the metrics.

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205. Navarro, *supra* note 204, at 112–13.

206. See JACK WINTER, WEST MONROE, THE RESURGENCE OF PERFORMANCE-BASED RATEMAKING 3, 4–5 (2015), <http://www.synapse-energy.com/sites/default/files/performance-based-reg-high-der-future.pdf>.

207. N.Y. DEP’T PUB. SERV. COMM’N, CASE 14-M-0101, ORDER ADOPTING A RATEMAKING AND UTILITY REVENUE MODEL POLICY FRAMEWORK 2 (May 19, 2016).

208. *Id.* at 154.

209. Fox-Penner et al., *supra* note 35.

210. *Id.*



## 2. Performance-Based Ratemaking's Influence in Hawai'i

In Hawai'i, performance-based ratemaking has been championed by the Blue Planet Foundation, a local nonprofit.<sup>211</sup> In 2014, the foundation proposed a RIIO-like “grand bargain,” in which the PUC would pull together the strands of a number of different ongoing regulatory efforts into the negotiation of an overall “business plan” for the HECO Companies.<sup>212</sup> Based on that business plan, the PUC would organize a multistakeholder process to develop metrics that measure the utilities' performance on six dimensions: (i) Safety & Reliability, (ii) Interconnection Quality, (iii) Customer Service, (iv) Environmental Performance, (v) Fossil Fuel Use Reduction/Elimination, and (vi) Customer Engagement.<sup>213</sup> The HECO Companies' rates would then be reformulated so that the utility would only earn its revenue requirement if it achieved adequate performance on these metrics. Rates would presumably rise or fall inversely with the utility's performance, though the Blue Planet Foundation did not emphasize the risk of rate variability.

The PUC rejected this ambitious proposal, opting instead to implement only a few “standalone performance incentive mechanisms,” limited to “conventional” issues only.<sup>214</sup> In the end, relatively minor potential incentive metrics were implemented, which would penalize the utility for poor call-center performance and grid-stability issues like frequency deviations.<sup>215</sup> The PUC explained that it was concerned that a more ambitious scheme would fail unless designed with great care. In particular, given that the HECO Companies had not yet articulated “clearly defined and accepted utility strategic plans,” the PUC reasoned that “it is difficult to bring desirable tactical objectives into clear enough focus to devise effective performance incentives without the risk of unintended consequences.”<sup>216</sup>

However, after several years of dormancy, the concept of performance-based ratemaking rose again to the forefront of Hawai'i's energy policy discourse in 2018. In April 2018, the PUC adopted a more ambitious performance-based rate incentive as part of a new competitive-bidding proceeding, in which the HECO Companies proposed to procure renewable energy from either new IPP projects or new HECO Companies-owned projects. After receiving comments from stakeholders, the PUC decided to implement a “shared-savings

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211. See *Who We Are*, BLUE PLANET FOUND., <https://blueplanetfoundation.org/about/> (last visited Nov. 15, 2018).

212. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2013-0141, BLUE PLANET FOUNDATION'S REPLY STATEMENT OF POSITION ON SCHEDULE B ISSUES, DECLARATION OF RON BINZ ¶ 54 (Sept. 15, 2014).

213. *Id.* at ¶ 73.

214. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2013-0141, ORDER NO. 32725, MODIFYING DECOUPLING MECHANISMS AND SETTING BRIEFING SCHEDULE (Mar. 31, 2015) [hereinafter Order 32725].

215. HAW. PUB. UTIL. COMM'N, DOCKET NO. 2013-0141, ORDER NO. 34750, DIRECTING THE HAWAIIAN ELECTRIC COMPANIES TO FILE REVISED PROPOSED INITIAL PERFORMANCE INCENTIVE MECHANISM TARIFFS (Aug. 11, 2017).

216. Order 32725, *supra* note 214, at 42.

incentive . . . based on an 80% customer / 20% utility split of the savings from each PPA, compared to benchmarks established by considering recent low-cost renewable energy projects, up to a cap of \$3,500,000.”<sup>217</sup> Specifically, the PUC looked at the prices offered by recent IPP renewable projects, and determined that “a reasonable benchmark for renewable energy projects paired with storage is 11.5 cents per kilowatt-hour” and that “[f]or renewable-energy-only projects, the commission determines that a reasonable benchmark is 9.5 cents per kWh.”<sup>218</sup> Thus for example, if HECO Companies procures the maximum 850 gigawatt hours (GWh) per year of renewable energy it seeks through the new proceeding at a price of about 7.5 cents per kWh, the savings relative to the benchmark would be \$17 million, of which the HECO Companies would get to keep \$3.4 million.<sup>219</sup>

Around the same time, the PUC opened a new docket to investigate performance-based ratemaking more generally.<sup>220</sup> In its opening order, the PUC explained that traditional cost-of-service regulation “may no longer properly incent the utility to adapt to the changing landscape, to meet the challenges of a renewable and distributed energy future, or to capitalize on the opportunities inherent to this transformation.”<sup>221</sup> In the new docket, the PUC will therefore invite analysis from the utilities and other intervenors regarding how performance-based regulation can be used to improve incentives, and thereby accelerate progress towards the PUC’s objectives.<sup>222</sup>

Less than a month later, the Hawai‘i legislature passed (and the Governor signed) an act targeted towards “improving the alignment of utility customer and company interests.”<sup>223</sup> In particular, the act mandates that:

[o]n or before January 1, 2020, the public utilities commission shall establish performance incentives and penalty mechanisms that directly tie an electric utility[’s] revenues to that utility’s achievement on performance metrics and break the direct link between allowed revenues and investment levels. In developing performance incentive and penalty mechanisms, the public utilities commission’s review of electric utility performance shall consider, but not be limited to, the following . . . (6) Rapid integration of renewable

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217. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2017-0352, ORDER NO. 35405, ESTABLISHING A PERFORMANCE INCENTIVE MECHANISM IN PHASE 1 OF THE HAWAIIAN ELECTRIC COMPANIES’ FINAL VARIABLE REQUESTS FOR PROPOSALS 11 (Apr. 6, 2018) [hereinafter Order 35405].

218. *Id.*

219. The HECO Companies’ new proposed “dispatchable” PPA structure focuses on the amount of energy renewable facilities are able to generate in a year, rather than the more traditional nameplate *power* rating. The stated amount of annual energy (850,000 megawatt hours (MWh)) is equivalent to about 385 MW of nameplate capacity, assuming an average capacity factor of 25 percent.

220. HAW. PUB. UTIL. COMM’N, DOCKET NO. 2018-0088, ORDER NO. 35411, INSTITUTING A PROCEEDING TO INVESTIGATE PERFORMANCE-BASED REGULATION (Apr. 18, 2018).

221. *Id.* at 13.

222. *Id.* at 14.

223. S.B. 2939, 29th Leg. (Haw. 2018); Julia Pyper, *Hawaii Gov Signs Performance-Based Ratemaking Into Law* (Apr. 24, 2018), <https://www.greentechmedia.com/articles/read/performance-based-ratemaking-becomes-law-in-hawaii#gs.1PE1wx8>.

energy sources, including quality interconnection of customer-sited resources; and (7) Timely execution of competitive procurement, third-party interconnection, and other business processes.<sup>224</sup>

### 3. *The Limitations of Performance-Based Ratemaking*

The PUC and legislature's enthusiastic new embrace of performance-based ratemaking is an important step forward in the PUC's sensitivity to incentive issues. Hawai'i policymakers have now identified the root causes of the problems discussed above, and are exploring ways to address those root causes. Unfortunately, the history and theory of performance-based ratemaking furnishes reasons to doubt that it will prove a sound approach for correcting utility incentives.

Consider, for example, the new performance mechanisms mandated in the 2018 procurement docket. The maximum one-time revenue windfall that the HECO Companies can earn by selecting viable, low-cost proposals and then cooperating with their IPP owners to make the projects a success is \$3.5 million.<sup>225</sup> By contrast, if the HECO Companies were to win the right to rate-base utility-owned projects of equivalent size—850 GWh per year—at a cost to ratepayers of 7.5 cents per kWh over the project's thirty-year useful life, they would receive additional revenues of \$1.9 billion.<sup>226</sup> Thus, the utility still has an incentive to favor utility projects over cooperation with IPPs.

It is, of course, possible to conceive a similar but more comprehensive performance-based system for achievement of Hawai'i's renewable energy targets, which would put enough dollars on the table to actually change the utility's incentives. For example, the utility's overall rates could be pegged to the amount and price of renewable energy it succeeds in procuring, such that it will only be profitable if it increases the renewable percentage of electricity generation by a target amount each year. To set up such a system, however, the regulator would at a minimum need to know the amount of renewable energy that is feasible and desirable for the utility to procure in a given year, and the expected reasonable cost of that renewable energy. This would in turn demand an analysis of the relative costs of various types of renewable energy that should be procured, given the numerous engineering constraints discussed in the context of resource planning. In short, the regulator would need to undertake the full resource-planning process that it tried and substantially failed to execute between 2010 and 2015.<sup>227</sup>

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224. See Haw. S.B. 2939.

225. Order 35405, *supra* note 217.

226. This comparison is not entirely fair, as the \$3.5 million in revenue would be "all profit," whereas the utility's profits on a utility-owned project would be only a fraction of the billions they would receive in revenue. Still, however, it is difficult to believe that a \$3.5 million earnings opportunity will materially influence the behavior of a \$4 billion enterprise.

227. Haw. S.B. 2939.

Performance-based ratemaking would do nothing to resolve the incentive and information asymmetries that plague this resource-planning process.<sup>228</sup> To the contrary, those problems could be exacerbated if the process is made the basis of a comprehensive performance-based pricing scheme. The utility would have an incentive to portray the regulator's goal—interconnection of renewable energy at an attractive price—as very difficult to achieve, so that the regulator would set benchmarks that it thought were aspirational, but which were in fact easy for the utility to achieve. Even after the fact, regulators might never truly know whether the baseline was set appropriately or not. The utility would present all utility performance as heroic; ratepayer and environmental advocates would look at the same performance and see sandbagging and utility windfalls.<sup>229</sup> It would take a regulator with uncommon confidence in the results of the resource-planning process to use it as the basis of a scheme that would put customers' electric bills at risk.

The risk of badly set baselines is likely the main reason that performance-based rate mechanisms have typically not advanced beyond experimental “pilot projects” or peripheral compensation mechanisms that affect only a small portion of a utility's revenue, without dramatically changing its incentives.<sup>230</sup> RIIO is an exception, but it is not the best example for Hawai'i. As described in more detail below, regulators in the United Kingdom used restructuring to dramatically reform incentives in that nation's electricity system long before RIIO was implemented. As a result, RIIO is applied only to “poles and wires” utilities, not to vertically integrated utilities like the HECO Companies, which have an incentive to use system control as a means of favoring investment in generation. That prior correction of incentives may be why it has proved feasible for stakeholders in the United Kingdom to reach agreement on a detailed “business plan,” while it has proven impossible for Hawai'i stakeholders to agree on a similarly detailed resource plan for execution of the renewable transformation.<sup>231</sup>

In short, performance-based ratemaking might be effective if the PUC had somehow *already* solved the incentives problems that bedevil planning proceedings. Absent such a correction of incentives, however, performance-

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228. Notice, for example, that the performance-based scheme implemented by the PUC in April, 2018 takes for granted the HECO Companies' proposal that only 850 GWh of renewable energy should be pursued, which was in turn based on the result of the above-described unsatisfactory resource planning process. The PUC also simply took the target wholesale prices at which the HECO Companies should procure that energy from a handful of recent projects, without digging into the question of whether the recent projects' pricing was attractive in the first place.

229. This is a risk even for the baselines the PUC has already set. For example, consider the PUC's above-described 11.5 cent per kWh threshold. If the utility succeeds in easily procuring 5-cent per kWh renewable energy, at least some are likely to question why HECO should be entitled to receive \$3.5 million for something it should have done anyway without such compensation.

230. The above-described outcome of the PUC's examination of performance-based ratemaking in 2014–15 is an example.

231. Moreover, there is little concrete evidence that RIIO is more effective than traditional utility regulation.

based ratemaking is likely to succeed only in shifting the incentives clash between utilities and the PUC to an earlier point in time, putting greater pressure on the PUC to develop good incentive baselines, and subjecting customers to the risk of bad baselines.

In this sense, Hawai'i policymakers' recent performance-based regulation efforts are well directed but incomplete. The discussion of incentives issues in the legislature's performance-based ratemaking Act and the PUC's new proceeding heavily emphasize the incentives problems created by cost-of-service regulation, but as explained in the previous Part, those incentives problems derive not only from regulation, but also from the industrial structure and governance of the electricity sector. Accordingly, performance-based ratemaking alone is unlikely to furnish a complete solution for Hawai'i's fundamental incentives problem. A more comprehensive reform effort must also grapple with the problems and potential of restructuring and governance reform, which are discussed in the next two subparts.

### *B. Restructuring*

During the 1990s, energy policymakers in many parts of the United States—but not Hawai'i—implemented aggressive structural reforms that fundamentally changed the industrial organization of the electricity sector, inventing creative, complex economic and technological mechanisms to make the structures work.<sup>232</sup> This experience offers Hawai'i a great deal of useful knowledge on which types of reforms work, which do not, and why. In this subpart, I argue that neither the simplistic wheeling model nor the “market”-oriented ISO model is a good fit for Hawai'i, but the “TransCo” or “divestiture of generation” reform is.

#### *1. Wheeling Theory and History*

The roots of restructuring are sometimes traced to the breakup of AT&T's vertically integrated monopoly, implemented in 1983 as part of the settlement of an antitrust action.<sup>233</sup> Economists Paul Joskow and Roger Noll refer to the theory underlying the AT&T remedy as the “Bell Doctrine,” stated as follows:

[R]egulated monopolies have the incentive and opportunity to monopolize related markets in which their monopolized service is an input, and . . . the most effective solution to this problem is to ‘quarantine’ the regulated monopoly segment of the industry by separating its ownership and control from the ownership and control of firms that operate in potentially competitive segments of the industry.<sup>234</sup>

As applied to the electricity sector, restructuring was premised on the idea that the vertical integration of electric utilities—previously taken for granted by

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232. See *infra* Parts II.B.1 and II.B.2.

233. Joskow & Noll, *supra* note 100, at 1249–50.

234. *Id.*

many observers—was not inevitable. Rather, the transmission and distribution segments in the middle of the electricity value chain were the only true natural monopoly bottlenecks; the wholesale generation and retail service functions on either end of these bottlenecks could be unbundled, deregulated, and made competitive.<sup>235</sup> This theory was sometimes coupled to a revisionist history of vertically integrated utilities, which blamed captured regulators for creating or perpetuating the “unnatural” extension of the core natural monopoly into segments of the industry that would have been competitive but for regulation.<sup>236</sup> It was therefore the job of modern regulators or antitrust law to dis-integrate the monopolies and allow competition to thrive in areas of the vertical value chain that were not natural monopoly markets.

The first attempt to reform the electricity system along these lines was FERC’s Order No. 888, which mandated the functional unbundling of generation, transmission, and ancillary services.<sup>237</sup> At a high level, the goal was to turn the wholesale electricity grid into a common carrier-style platform, across which IPPs could “wheel” their electricity to the customers of their choice, such as large industrial customers, municipal electricity systems, and remotely located distribution utilities.<sup>238</sup> The result would replace the one-to-many market created by PURPA (and still extant in Hawai‘i) with a true multilateral wholesale market, in which many participants would compete on both the buy and the sell side of the market. The utility owning the transmission platform between buyers and sellers would continue to be traditionally regulated, and would be paid for wheeling service at rates calculated according to traditional cost-of-service principles. In other words, regulators would separate the costs the utility prudently incurred in building and maintaining its transmission service from the costs incurred for generation and other tasks. It would then divide these costs by the traffic the infrastructure was expected to carry, and thereby generate a nondiscriminatory wheeling rate (“open access tariff”) that would be paid to the transmission owner by its transmission-only customers.

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235. Peter Z. Grossman & Daniel H. Cole, *Introduction*, in *THE END OF A NATURAL MONOPOLY* 1, 1–3 (Peter Z. Grossman & Daniel H. Cole eds., 2003); Joseph P. Tomain, *Whither Natural Monopoly? The Case of Electricity*, in *THE END OF A NATURAL MONOPOLY*, *supra*, at 111, 120, 127–28.

236. Peter Z. Grossman, *Is Anything Naturally a Monopoly?*, in *THE END OF A NATURAL MONOPOLY*, *supra* note 235, at 11, 22–32; Robert Bradley, Jr., *The Origins and Development of Electric Power Regulation*, in *supra* note 235, at 43, 71–72 (2003); R. Richard Geddes, 15 *A Historical Perspective on Electric Utility Regulation*, in *CATO REVIEW OF BUSINESS AND GOVERNMENT* 75 (1992), <http://object.cato.org/sites/cato.org/files/serials/files/regulation/1992/1/v15n1-8.pdf>.

237. *Id.* In so doing, FERC exercised new authority delegated to it by Congress in 1992. See Energy Policy Act of 1992, Pub. L. 102-486, §§ 721-722, 106 Stat. 2776 (1992) (codified at 16 U.S.C. § 824j-k).

238. The principle that networks should open themselves to all users has a long tradition in the regulation of common carriers such as telecommunications and transportation providers, and is the focus of the contemporary debate over net neutrality. However, electric utilities, unlike telecommunications networks, traditionally had no third-party traffic to open themselves to, which was a corollary of their traditional vertical integration. See, e.g., sources cited *supra* note 236; *Hush-A-Phone Corp. v. United States*, 238 F.2d 266, 269 (D.C. Cir. 1956); Tim Wu, *The Broadband Debate, A User’s Guide*, 3 J. ON TELECOMM. & HIGH TECH. L. 69, 84–88 (2004).

Unfortunately, the contract path-based logic of this vision was at odds with the physical reality of electricity grids, which differ in important ways from common-carrier networks like telecommunications and transportation systems.<sup>239</sup> Telecommunications networks, for example, are switchable systems that can take a signal from one user and route it to another user.<sup>240</sup> Electricity grids, by contrast, are more like water reservoirs, into which generators pump electricity and from which customers draw electricity, with no ability to control or even determine the path the electricity takes from producer to consumer.<sup>241</sup> Even more problematically, to preserve the stability of an electricity grid, its operator must match electricity generation to electricity demand on an instant-by-instant basis.<sup>242</sup> As explained above, utilities typically preserve grid stability by maintaining a partially redundant portfolio of controllable generation resources, the output of which they adjust on an instant-by-instant basis to serve instantaneous demand.

Because of these fundamental physical characteristics, minimalistic nondiscrimination or “net neutrality” models that are currently popular among commentators on internet regulation<sup>243</sup> do not work for electricity regulation. FERC could not simply say, “Thou shalt not favor the carriage of thy own electricity over that of thy competitors.” Instead, Order No. 888 had to ensure that utilities retained the power and funding necessary to coordinate the grid. Among other things, this required FERC to elaborate an unbundled list of “ancillary services”—regulating reserves—that the utilities would need to maintain their systems in balance, and to use traditional cost-of-service principles to calculate the portion of these total ancillary services costs that should be included in the new transmission-only rates.

This exercise was inherently controversial, for much the same reasons PURPA avoided cost-setting or net energy-metering reform. From the utility perspective, Order No. 888 crudely threw open their sophisticated, integrated, and carefully engineered systems to disruption from foreign attachments.<sup>244</sup> But from the IPP perspective, utilities exaggerated the technical concerns and inflated the costs attributable to transmission-only service in order to resist competition.<sup>245</sup> In adjudicating the answers to those questions, FERC was forced

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239. SALLY HUNT, MAKING COMPETITION WORK IN ELECTRICITY 147 (2002); WILLIAM HOGAN, MARKET DESIGN AND ELECTRICITY RESTRUCTURING 16 (2005), [https://www.hks.harvard.edu/fs/whogan/hogan\\_apex\\_110105.pdf](https://www.hks.harvard.edu/fs/whogan/hogan_apex_110105.pdf) (arguing that there is a “fatal flaw” in the contract path vision, which FERC was aware of at the time of Order 888, but ignored due to its inconvenience).

240. *Id.*

241. *Id.*

242. *Id.*

243. Mark A. Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 UCLA L. REV. 925, 925–30 (2001); Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. ON TELECOMM. & HIGH TECH. L. 141, 141–44 (2003).

244. Duane, *supra* note 98, at 486; HIRSH, *supra* note 81, at 125–31; Cudahy, *supra* note 95, at 423–25, 431–33.

245. Cudahy, *supra* note 95, at 438.

to confront the same familiar information asymmetries and incentives misalignments that plagued the traditional regulatory framework and limited the effectiveness of performance-based ratemaking. The utilities had an economic incentive to resist wheeling and had all the information and experience necessary to calculate the rates on which wheeling would be based.<sup>246</sup> Even to the extent that these difficulties were overcome, wheeling could at best allow for the independence of only part of the wholesale generation market, because the system operator needed to maintain control over at least some generation in order to balance the system.<sup>247</sup>

## 2. *Why Wheeling Won't Work in Hawai'i*

In Hawai'i, the wheeling vision has been recently resurrected in popular calls to throw the grid open to competition as a “common carrier,”<sup>248</sup> as well as in policy discussions regarding “transactive energy” or “market” distributed energy resources compensation mechanisms. In fact, as described above, the PUC states that it intends to pursue some version of the “market” concept in “Phase II” of its distributed energy resource docket.<sup>249</sup> Portrayed in the most ambitious but naïve terms, the idea is that “prosumers” should be allowed to freely execute peer-to-peer retail transactions with one another over electricity distribution and transmission networks. For example, if I have extra space on my roof, I should be able to sell my neighbor energy. If he has extra space in his garage, he should be able to sell me battery storage. And we should both be able to sell to a utility located on the other side of the state the right to adjust the output of my array up and down to help the utility manage its load—all without any “red tape” imposed by our local utility or regulator.

Thus described, however, distributed energy resource markets are merely the latest incarnation of the old “contract path” dream, which will prove no more workable for rooftop solar than it did for larger-scale generation resources. If I sell electricity to my neighbor, that sale decreases the electricity that the neighbor draws from the local grid, and thereby also decreases the electricity that the utility draws from the larger-scale transmission system. Similarly, if I sell an

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246. See *supra* notes 233–234 and accompanying text.

247. *Supra* note 232.

248. See, e.g., Stewart Yerton, *Why Hawaii Residents Can't Build Their Own Private Power Grids*, HONOLULU CIVIL BEAT (Dec. 7, 2017), <https://www.civilbeat.org/2017/12/why-hawaii-residents-cant-build-their-own-private-power-grids/>.

249. See, e.g., PAUL DE MARTINI ET AL., PLANNING FOR MORE DISTRIBUTED ENERGY RESOURCES ON THE GRID (2016), [http://morethansmart.org/wp-content/uploads/2016/09/plug-and-play-report\\_online\\_v2.pdf](http://morethansmart.org/wp-content/uploads/2016/09/plug-and-play-report_online_v2.pdf); GRIDWISE ARCHITECTURE COUNCIL; GTM RESEARCH, GRID EDGE: UTILITY MODERNIZATION IN THE AGE OF DISTRIBUTED GENERATION 13 (2013); JON WELLINGHOFF ET AL., THE 51ST STATE OF WELHUTON: MARKET STRUCTURES FOR A SMARTER, MORE EFFICIENT GRID 4-5 (2015); N.Y. DEP'T PUB. SERV. COMM'N, CASE 14-M-0101, ORDER ADOPTING REGULATORY POLICY FRAMEWORK AND IMPLEMENTATION PLAN 5 (Feb. 26, 2015); see generally GRIDWISE TRANSACTIVE ENERGY FRAMEWORK VERSION 1.0 (2015), [http://www.gridwiseac.org/pdfs/te\\_framework\\_report\\_pnnl-22946.pdf](http://www.gridwiseac.org/pdfs/te_framework_report_pnnl-22946.pdf).



ancillary service or demand response to a remotely located, load-serving entity, that entity will also change the services it draws from the overall system. Allowing such “side deals” to take place outside the system operator’s integrated dispatch and market settlement process would reduce the operator’s ability to optimally and securely dispatch the system. Accordingly, as the more thoughtful accounts of transactive energy acknowledge, any true distributed market will need a way to coordinate market transactions among dispersed parties, just as Independent System Operators (ISOs, described in more detailed below) do for wholesale transactions today on the mainland, and the HECO Companies do for Hawai‘i’s grids.<sup>250</sup>

In Hawai‘i, a market-based distributed energy policy would require either (i) the setup of an ISO with the ability to dispatch both the wholesale resources on the grid as well as the distributed energy resources (a policy I explore in more detail in the next subpart), or (ii) the assignment of distributed energy dispatch responsibilities to the utilities, despite their incentives to oppose distributed energy resources.<sup>251</sup> Neither arrangement would be consistent with the dream of a decentralized market for distributed energy.

In some accounts of the decentralized future of distribution systems, technology will eliminate these transactions costs.<sup>252</sup> The software agents in our smart water heaters and washing machines will use blockchains and artificial intelligence to do business with each other on our behalf, continuously arbitraging and exploiting cost-savings opportunities, without the need for our intervention, or even our knowledge. Such “rule by benevolent algorithm” is certainly not beyond the realm of imagination.<sup>253</sup> However, merely because the distribution grid *can* be redesigned around decentralized algorithms does not mean that it *should be*. To my knowledge, no rigorous case has been attempted

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250. See, e.g., PAUL DE MARTINI & LORENZO KRISTOV, DISTRIBUTION SYSTEMS IN A HIGH DISTRIBUTED ENERGY RESOURCES FUTURE 31 (2015), <https://emp.lbl.gov/sites/all/files/lbnl-1003797.pdf>.

251. In restructured states such as California and New York, FERC policies are underway that would allow for existing ISOs to provide such wholesale market integration to some extent. See Jeff St. John, *As California Prepares for Wholesale Distributed Energy Aggregation, New Players Seek Approval*, GREENTECH MEDIA (Mar. 14, 2017), <https://www.greentechmedia.com/articles/read/california-companies-are-ying-for-aggregated-distributed-energy>; NY ISO, DISTRIBUTED ENERGY RESOURCES ROADMAP FOR NEW YORK’S WHOLESALE ELECTRICITY MARKETS (Jan. 2017); FERC, *Notice of Proposed Rulemaking, Electric Storage Participation in Markets Operated by Regional Transmission Organizations and Independent System Operators*, 157 FERC ¶ 61,121 (Nov. 17, 2016), <https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-1.pdf>.

252. See, e.g., Diane Cardwell, *Solar Experiment Lets Neighbors Trade Energy Among Themselves*, N.Y. TIMES (Mar. 13, 2017), <https://www.nytimes.com/2017/03/13/business/energy-environment/brooklyn-solar-grid-energy-trading.html>. However, it is not clear how a computing technology like blockchain will succeed in addressing the fundamental electrical engineering challenges discussed above. See Chenghua Zhang et al., *A Review of Existing Peer-to-Peer Energy Trading Projects*, 105 ENERGY PROCEDIA 2563, 2567–68 (2017).

253. Paul de Martini and Lorenzo Kristov seem to think that a model with numerous peer-to-peer energy transactions between DERs is theoretically feasible, but would require solutions to presently unsolved technical challenges. DE MARTINI & KRISTOV, *supra* note 250, at 50.

for the superiority of that model.<sup>254</sup> In the absence of reasons to believe in the practical superiority of a transactive energy model, any time the PUC spends pursuing that objective is likely to prove an unfortunate distraction from policy work on decarbonizing the electricity grid, an objective of indisputable value.

### 3. *Restructuring Theory and History*

When the wheeling or “functional unbundling” model failed to furnish a comprehensive paradigm capable of superseding the cost-of-service paradigm, policymakers in the 1990s turned to “structural unbundling.” The main goal of this more invasive category of reform was to dis-integrate generation ownership from transmission system control, including the dispatch of power plants to balance load.<sup>255</sup> The integration of these two functions in traditional utilities was thought to be the root problem that had tainted all previous attempts to inspire wholesale competition. So long as a utility continued to both own generation and control the transmission grid, it would have an economic interest to use its transmission-system control to favor its generation over its competitors’ generation, thereby preventing IPPs from reaching potential alternative electricity buyers.<sup>256</sup>

Action on the restructuring idea was initiated in the 1990s by FERC and many states. Two main models were debated.<sup>257</sup> The TransCo model—a concept of particular importance to this Article—proposed the creation of for-profit, regulated utilities that would own and control all the transmission assets previously owned by various vertically integrated utilities in a given region. However, these new utilities would own no generation and serve no retail customers.<sup>258</sup> Such TransCos would thus have an incentive to plan and dispatch their networks as nondiscriminatory platforms across which independent generators and distribution utilities could transact. The alternative ISO model

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254. Many electricity commentators tend to casually conflate increased sophistication with increased functionality or value. *See, e.g.*, PAUL DE MARTINI ET AL., *supra* note 249. What is often missing from the contemporary electricity discourse is the perspective of the net neutrality proponents, who recognized that the internet needs a “dumb,” standardized, impartial middle so that innovation expands at the ends of the network. In fact, the net neutralists often pointed to the “dumb” electrical grid as an innovation platform of incalculable value, in that its simple open architecture allowed unbounded innovation in the electrical appliance market.

255. HUNT, *supra* 239, at 59–63.

256. A related secondary form of restructuring was the separation of *transmission system ownership* from *generation ownership*, through the divestiture of power plants by transmission utilities. Restructuring advocates believed this additional step to be worthwhile for two reasons. First, a utility that has lost control but not ownership of its transmission assets might still find “subtle ways in which [it] can thwart [generation] competitors by being dilatory about construction and maintenance of the transmission assets,” and it will have an incentive to engage in such favoritism as long as it hopes to develop its own generation projects rather than rely on those of others. Second, forced divestiture of generation assets was a convenient means of increasing the number of post-restructuring generation competitors, thereby helping to avoid market power problems in the new wholesale generation markets. *Id.* at 59–63, 145–46.

257. The models are depicted *infra* Figure 9.

258. Tomain, *supra* note 235, at 128–29.

instead proposed to create regional nonprofit, federally regulated system operators, to which traditional vertically integrated utilities would divest system control but not system ownership.<sup>259</sup> The utilities would thus retain transmission and distribution system ownership, distribution system control, and generation.<sup>260</sup> However, they would be deprived of the ability to use system control to favor their own generation over that of others. In other words, the core distinction between the two models is that the TransCo model aims to remove the utilities' incentive but not power to discriminate, whereas the ISO model aims to remove the utilities' power but not incentive to discriminate.

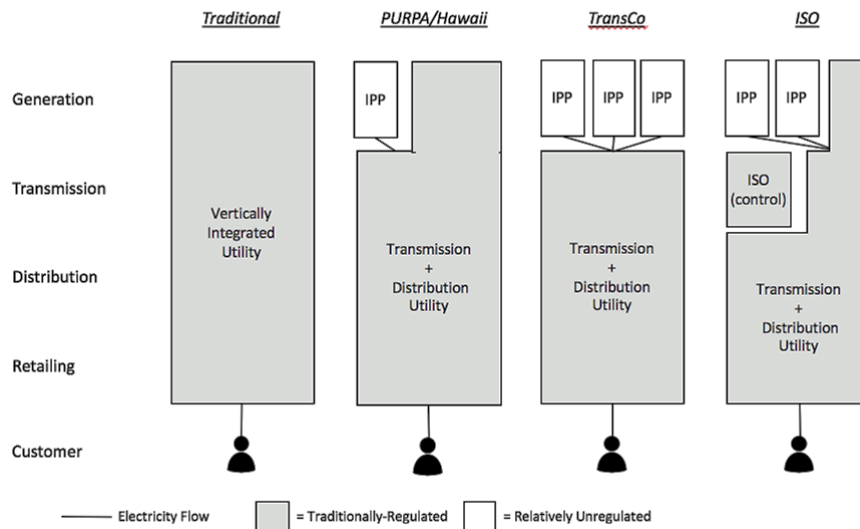


Figure 9: Comparison of TransCo and ISO Models<sup>261</sup>

The TransCo model was implemented in the United Kingdom, but the ISO model prevailed in all of the U.S. states that decided to restructure.<sup>262</sup> Thus, for example, in California, the three large incumbent utilities (Pacific Gas & Electric, San Diego Gas & Electric, and Southern California Edison) continue to own some power plants, most high-voltage transmission infrastructure, and most

259. *Id.*

260. *Id.*

261. Created by the author. In both the ISO and TransCo models, the transmission-owning utility may be separate from the generation-owning utility; typically, a transmission-owning utility serves multiple distribution utilities. This complexity is elided in the diagram for the sake of simplicity and applicability to the Hawai'i context, in which there is little distinction between transmission and distribution.

262. HUNT, *supra* note 239, at 302–03; BORENSTEIN & BUSHNELL, *supra* note 92, at 5–6; WILLIAM HOGAN, REGIONAL TRANSMISSION ORGANIZATIONS: MILLENNIUM ORDER ON DESIGNING MARKET INSTITUTIONS FOR ELECTRIC NETWORK SYSTEMS 8 (2000); HUNT, *supra* note 239, at 299–310; Tomain, *supra* note 235, at 128–32.

lower-voltage local distribution grids.<sup>263</sup> However, they have ceded to the California ISO control over the dispatch of all power plants (whether owned by a utility or an IPP) and the transmission of power through their transmission infrastructure.<sup>264</sup>

Even as ISO-based restructuring solves the incentives problems that had bedeviled previous forms of regulation, however, it raises new coordination problems. The most strident proponents of restructuring downplayed the value of coordination by a vertically integrated utility, suggesting that restructuring could somehow replace this “engineering coordination” with decentralized “market coordination.”<sup>265</sup> But since electricity doesn’t obey a transaction’s contract path, market coordination will only work if it somehow guarantees that all of the bilateral transactions among uncoordinated parties will precisely match demand on a second-by-second basis—a more instantaneous type of optimization than the iterative process by which the “invisible hand” works. A set of wholesale contracts could perhaps be written to provide such coordination without any central authority, but they would at a minimum need to give the wholesale buyer—for example, a distribution utility—substantial control over the seller’s generation asset—for example, an IPP plant—, so that the buyer could be assured of the flexibility it needs to respond to load. Additionally, a set of interbuyer contracts would likely need to be written to coordinate various buyers’ purchases in a way that prevents imbalances. In other words, if forced to structurally dis-integrate according to a crude application of a market-based vision, the participants in the new “market” would elect to reintegrate, this time by contract rather than by merger.<sup>266</sup>

For this reason, all of the restructuring initiatives instead settled on a system that gave the new ISOs centralized, top-down system control, while using computerized optimization algorithms to generate “market” prices, paid by distribution utilities and other retail load-serving entities to generation owners.<sup>267</sup> Specifically, three main types of transactions are conducted in such systems. First, IPPs and distribution utilities bilaterally enter into forward power purchase agreements for the supply of energy, just as utilities do with IPPs in

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263. However, most power plants were divested, and California’s utilities are increasingly becoming “poles and wires” companies. See Severin Borenstein, *The Trouble with Electricity Markets: Understanding California’s Restructuring Disaster*, 16 J. ECON. PERSPECTIVES 191, 195 (2002).

264. *Id.* at 194 (describing California’s original restructuring model, which gave somewhat less control to the ISO; this model has since been replaced with a model that conforms to the standard prescriptions described in this paragraph).

265. See, e.g., Andrew P. Morriss, *Why the Music is Off-Key When Lawyers Sing from Economists’ Songbooks Or Why Public Utility Deregulation will Fail*, in THE END OF A NATURAL MONOPOLY, *supra* note 235, at 193, 203, 221; Bernard S. Black & Richard J. Pierce, Jr., *The Choice Between Markets and Central Planning in Regulating the U.S. Electricity Industry*, 93 COLUM. L. REV. 1339, 1341 (1993).

266. See generally Paul L. Joskow, *Contract Duration and Relationship-Specific Investments: Empirical Evidence from Coal Markets*, 77 AM. ECON. REV. 168, 168 (1987) (observing that coal suppliers and electricity generators choose to enter into long term arrangements because otherwise the asset specificity of their investments would result in “hold up” negotiations).

267. HUNT, *supra* note 239.

Hawaii's system.<sup>268</sup> For example, a wind farm might sign a twenty-year agreement to sell all of its output to PG&E (a distribution utility) at a fixed rate. The difference is that in an ISO system, the parties to the power purchase agreement must "schedule" these transactions with the ISO.<sup>269</sup> Second, when these contracts do not perfectly match electricity load and generation, the ISO balances the system using day-ahead and hour-ahead spot markets.<sup>270</sup> IPPs who expect to produce excess power that they have not already sold by a forward contract offer it into these markets at the price of their choice.<sup>271</sup> On the other side of the market, distribution utilities disclose the shortfalls between the power they have already contracted bilaterally and the power they expect to actually need.<sup>272</sup> Based on the IPP offers and the utility power needs, the ISO's optimization software calculates the minimum production cost of satisfying the utilities' needs while keeping the system in balance. The software also identifies the location-specific market-clearing price, which is the price offered by the "last" (highest-priced) bidder needed to balance the system. All generators are paid this price for power sold through the market, and all utilities pay the same price for the day-ahead energy they buy.<sup>273</sup> Finally, to the extent that the actual system deviates from the day-ahead and hour-ahead expected needs, the ISO dispatches power plants as necessary to keep the grid in balance, paying the power plant owners and billing utilities according to its actual dispatch.

The practical result of this "market" solution more closely resembles the vertically integrated "engineering" solution than is commonly acknowledged. Both models use a least-cost dispatch algorithm to match generation to load, taking into account transmission constraints. In both models, this least-cost dispatch is calculated in part based on regulator-approved, up-front costs (for utility assets), and in part based on regulator-approved prices locked in under long-term contract (for IPP costs). The main novelty of the restructured system is that the least-cost dispatch algorithm now also factors in discretionary, unconstrained bids submitted into day-ahead and hour-ahead spot markets by the minority of generation owners that operate as contract-free "merchant" power plants.<sup>274</sup>

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268. December 2016 PSIP, *supra* note 40, at M-40.

269. HUNT, *supra* note 239, at 130, 168-72.

270. Andrew L. Ott, *Experience with PJM Market Operation, System Design, and Implementation*, 18 IEEE TRANSACTIONS ON POWER SYS. 528, 528 (2003); PJM, OVERVIEW OF THE ENERGY MARKET (2016), <http://www.pjm.com/~media/committees-groups/committees/mrc/20160824/20160824-item-01-day-ahead-overview.ashx> [hereinafter Energy Market].

271. See Ott, *supra* note 270, at 528-30; Energy Market, *supra* note 270, at 5-10.

272. See Ott, *supra* note 270, at 528-30; Energy Market, *supra* note 270, at 5-10.

273. See Ott, *supra* note 270, at 528-30.

274. BORENSTEIN & BUSHNELL, *supra* note 92, at 4.

#### 4. *Why ISO Restructuring Isn't a Good Fit for Hawai'i*

Was ISO-based restructuring a success? It was in the limited sense of creating a new, workable industry pattern. Unlike PURPA or Order No. 888, the ISO-based restructuring schemes succeeded in creating a paradigm that has functioned for two decades. Moreover, by removing system operation and planning from utility control, restructuring succeeded in eliminating the utilities' ability to discriminate in favor of their own wholesale generation interests. This in turn allowed the scope of regulation to be pared back to the transmission and distribution bottlenecks, just as the proponents of restructuring originally envisioned.

In this sense, an ISO model, unlike a wheeling model, might furnish a stable framework for promoting development of renewable energy projects by IPPs. In a fully restructured system (wholesale and retail), renewable IPPs could sell electricity to competitive retailers in true multilateral markets, in which competitive demand and supply conditions would set the daily and hourly price of electricity, and these prices would in turn guide IPPs' decisions about the amount and type of energy facilities that should be developed, with no need for planning by the utility or regulator.

However, in Hawai'i, the ISO model is likely to run into significant problems: it is doubtful that Hawai'i's island systems are big enough to host workably competitive spot markets. The smallest ISO system in the United States (New England) has more than 30,000 MW of generation.<sup>275</sup> The ISOs in California, New York, New England, the Midwest, and the Mid-Atlantic (PJM) all have more than 150,000 MW of generating capacity at their disposal.<sup>276</sup> In contrast, HECO controls approximately 2000 MW of capacity, and MECO controls approximately 200 MW. Thus, electricity spot markets in Hawai'i could be easily manipulated by one or two IPPs, as California's much larger market was manipulated in 2001<sup>277</sup> Indeed, this danger would likely be exacerbated in a system with a very high penetration of renewables. On days when intermittent generation such as wind and solar facilities produce little energy, the market power of owners of firm generation would be difficult to control.<sup>278</sup>

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275. *Electric Power Markets: New England (ISO-NE)*, FED. ENERGY REG. COMM'N (Aug. 1, 2017), <https://www.ferc.gov/market-oversight/mkt-electric/new-england.asp>.

276. *Id.*

277. Jason Leopold, *Enron Linked to California Blackouts*, MARKETWATCH (May 16, 2002), <https://www.marketwatch.com/story/enron-caused-california-blackouts-traders-say>.

278. The limitations of the ISO model in Hawai'i are largely ignored in the Guernsey Report. Guernsey Report, *supra* note 24, at 32 (counseling that "the ideal path forward to meet the County's objectives is to organize, develop and enable a private entity akin to an Independent System Operator (ISO) . . . to oversee the electric grid and energy market while ensuring a reliable power supply . . . . This approach promotes competition by providing clear price signals and market transparency so that power producers of all types can make rational economic decisions; this approach also optimizes transmission planning such that all power producers are incorporated into planning and infrastructure improvement efforts"). Guernsey provides no analysis of whether such a system is likely to function at a scale that is a

Moreover, even where bigger markets exist, there is no evidence that ISO-based restructuring has succeeded in creating a better performing alternative to the old system. In its original orders promoting the concept, FERC estimated that nationwide restructuring would reduce electricity prices enough to save electricity customers \$2.4 billion per year (roughly \$25 per U.S. family per year).<sup>279</sup> In fact, however, electricity prices have risen faster in restructured states than nonrestructured states.<sup>280</sup> Even after using statistical techniques to correct for lurking variables like higher-than-average reliance on natural gas prices, analysts have concluded that restructuring has had no statistically significant impact on electricity prices.<sup>281</sup> Indeed, the most important efficiencies sometimes attributed to restructuring by its proponents may be the result of the integration of smaller electricity dispatch pools into larger, regional systems, efficiencies that could have just as well been achieved without the creation of spot markets and other market-based reforms.<sup>282</sup> As of 2017, electricity prices remain lowest in the South and Northwest, which are not restructured, and highest in California and the Northeast, which are.<sup>283</sup> Even under the assumptions most favorable to restructuring, therefore, it seems safe to say that restructuring did not live up to FERC's hopes.<sup>284</sup>

Why might FERC have been wrong about the potential efficiencies associated with restructuring? The question implicates a more fundamental theoretical question: is vertical integration (i) an anticompetitive extension of natural monopoly power, or (ii) an efficient response to ineradicable transactions costs inherent to electricity service? In the first case, restructuring is a good idea; in the second, it is not. Many (though not all) advocates of restructuring assumed that vertical integration was anticompetitive, without fully contemplating its efficiencies.<sup>285</sup> Transactions-cost economics, also known as the new institutional economics, offers a more sophisticated analysis. This discipline posits that

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tiny fraction of the size of all mainland ISO systems. Nor does it acknowledge that mainland ISOs have been no more successful at achieving regulators' goals than traditionally regulated systems.

279. Order No. 2000, *supra* note 104, at 830.

280. BORENSTEIN & BUSHNELL, *supra* note 92, at 18.

281. *Id.* See also Seth Blumsack, *Measuring the Benefits and Costs of Regional Electric Grid Integration*, 28 ENERGY L.J. 147, 182–83 (2007) (reviewing several studies of the success of restructuring and noting that they have reached different conclusions and may be analyzing an incomplete set of metrics).

282. Blumsack, *supra* note 281, at 148, 171–72.

283. Spence, *supra* note 101, at 776–77.

284. It is possible that restructuring had a positive effect on the environment by encouraging the replacement of dirtier plants by a newer generation of natural gas plants, but the question is complex, and the causal effect of restructuring is dwarfed by other factors. KAREN PALMER & DALLAS BURTOW, RESOURCES FOR THE FUTURE, THE ENVIRONMENTAL IMPACTS OF ELECTRICITY RESTRUCTURING 35 (2005), <https://ageconsearch.umn.edu/bitstream/10656/1/dp050007.pdf>.

285. See, e.g., *supra* notes 235, 265. Some architects of restructuring had a clear view of the importance of transactions cost from the outset. HUNT, *supra* note 239, at 25; Paul L. Joskow, *The Role of Transaction Cost Economics in Antitrust and Public Utility Regulatory Policies*, 7 J.L. ECON. & ORG. 53, 66–67 (1991); PAUL L. JOSKOW & RICHARD SCHMALENSEE, MARKETS FOR POWER: AN ANALYSIS OF ELECTRIC UTILITY DEREGULATION 120 (1983); 2 KAHN, *supra* note 81, at 251–53, 314–23.

vertical segments of an industry tend to be integrated into a firm when the advantages of in-firm “visible hand” organization—rational coordination—exceed the advantages of “invisible hand” market organization—incentives to maximize work effort.<sup>286</sup> In a given industry, the relative advantages of in-firm versus market organization are determined by a host of centrifugal and centripetal forces, including principal-agent problems, information asymmetries, incomplete contracts, asset specificity, coordination problems, and the cost of dispute resolution.<sup>287</sup> The extent to which these various types of “transactions costs” (a somewhat misleading label) are inherent to a particular task determines whether the most efficient mode of economic organization is a spot market, vertically integrated firm, or a contract (which is a hybrid of spot market and firm organization).<sup>288</sup>

Thus, even if we conclude that the generation segment of the electricity value chain is not naturally a monopoly, it does not necessarily follow that it will be efficient to structurally unbundle that segment from the natural monopoly segments. We must also consider whether vertical integration of the monopoly and nonmonopoly segments might nevertheless be efficient in light of asset specificity, coordination, incomplete contracts, and so on. If so, restructuring is an attempt by government to “unnaturally” force markets to work for tasks that markets themselves prefer to use in-firm coordination to accomplish.

Indeed, the restructured systems that have succeeded have done so because they have taken seriously the inherent need for centralized inter-firm coordination. As described above, ISO systems centrally control electricity systems in much the same way utilities formerly did, even as they rhetorically emphasize the “market” aspects of their optimization algorithms.<sup>289</sup> Furthermore, most systems have not entrusted long-term power-system planning to market-generated price signals alone. Instead, they have given the ISO planning functions that help ensure adequacy of supply. They have also set up separate, mandatory capacity markets designed to provide additional incentives to certain power plants needed to keep the system running securely.<sup>290</sup> In fact, in

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286. Ronald H. Coase, *The Nature of the Firm* (1937), in *THE NATURE OF THE FIRM: ORIGINS, EVOLUTION, AND DEVELOPMENT* 18, 19 (Oliver E. Williamson & Sidney G. Winter eds., 1993).

287. OLIVER E. WILLIAMSON, *THE ECONOMIC INSTITUTIONS OF CAPITALISM* 3–4 (1985).

288. Oliver E. Williamson, *Public and Private Bureaucracies: A Transactions Cost Economics Perspective*, 15 *J.L. ECON. & ORG.* 306, 313–14, 322 (1999).

289. By contrast, the restructuring implemented in California in the 1990s failed in part because California failed to appreciate the value of in-firm coordination, choosing to operate spot markets separately from the ISO’s grid balancing activities, and requiring utilities to purchase all of their power through spot markets, instead of partially vertically reintegrating through forward contracts. See JOHN D. CHANDLEY ET AL., *ELECTRICITY MARKET REFORM IN CALIFORNIA* 2–3 (2000), [https://www.hks.harvard.edu/fs/whogan/chhferc\\_ca\\_112200.pdf](https://www.hks.harvard.edu/fs/whogan/chhferc_ca_112200.pdf). But see Peter Z. Grossman, *Does the End of a Natural Monopoly Mean Deregulation*, in *THE END OF A NATURAL MONOPOLY*, *supra* note 235, at 215, 220, 237, 239 (2003) (blaming fixed retail prices for the California crisis, rather than market design).

290. PAUL L. JOSKOW, *CAPACITY PAYMENTS IN IMPERFECT ELECTRICITY MARKETS: NEED AND DESIGN* 3–4 (2007), <https://economics.mit.edu/files/2095>.



2017 and 2018, there was much discussion of concerns that market electricity prices no longer adequately incentivize vital baseload generation facilities—large coal, gas, and nuclear plants designed to constantly provide low-cost power—and FERC and the Department of Energy debated new rules that would require restructured systems to adopt new supplementary compensation mechanisms for such assets.<sup>291</sup>

In sum, the ISO model's misguided attempt to inject market organization of areas of the economy where markets are suboptimal ended up increasing the complexity and the cost of electricity delivery. While the ISO-based reform might furnish a way to limit Hawai'i utilities' power to use their "wires" monopoly to resist the development of renewable energy by IPPs, it would be an unnecessarily complex and expensive means of achieving that objective—even if Hawai'i were big enough to host workably competitive markets, which it probably is not.

##### *5. Why TransCo Restructuring Could Solve Hawai'i's Incentive Issues*

The TransCo model of restructuring, which was discussed but never implemented in the United States during the 1990s, is a much more attractive prospect for Hawai'i. The TransCo model could allow Hawai'i's utilities to retain ownership of all "poles and wires," and to continue to control the dispatch of the system. However, the utilities would be required to divest ownership of all generation to one or more IPPs ("GenCos"). The TransCo (the incumbent utility) would plan new system additions as necessary to serve its customers, and would be required to use competitive bidding to procure that capacity from IPPs at the lowest price. However, because it would have no interest in investing in generation, the TransCo would have no disincentive to cooperate with its IPP suppliers.

Where the ISO model was influenced by the misguided pursuit of market organization to the exclusion of other objectives, the TransCo model correctly zeroes in on the incentives problems that are the root cause of inefficiency, without eliminating the efficient vertical integration of wholesale system control with system ownership, management, and retailing. The TransCo would continue to plan and operate the system just as it does today. The only difference is that its control of generators would be entirely based on contract rights to control IPP facilities, whereas today its system control is based partly on such contract rights and partly on property rights stemming from ownership of its own generation—a distinction that will not make a practical difference.<sup>292</sup> The small number of

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291. Ray Gifford & Matt Larson, *The DOE NOPR: An Inevitable Next Step in Power 'Market' Regulation*, UTILITY DIVE (Oct. 6, 2017), <http://www.utilitydive.com/news/the-doe-nopr-an-inevitable-next-step-in-power-market-regulation/506703/>.

292. Hawai'i utilities are likely to resist the TransCo model on the grounds that it would be practically workable to deprive the utility grid operator of ownership of the power plants it needs to keep the grid in balance. For example, during recent attempts to obtain PUC approval for the ownership of generation, the HECO Companies argued that when a utility owns an asset, the utility has more operational

IPPs would not give rise to market power, because IPPs would not need to trade in spot markets, but could be required by the TransCo to offer locked-in pricing under long-term power purchase agreements upon their selection via a competitive bidding process. And finally, the whole arrangement requires relatively little in the way of complex policymaking or technological innovation. All that would be required is the one-time forced divestiture of utility-owned generation, together with a law that forbids utilities from owning generation at any time in the future.

One known flaw in the TransCo model is that TransCo would have an incentive to overinvest in grid upgrades whenever possible as an alternative to generation upgrades, since grid upgrades allow it to receive a return on investment, whereas purchasing new generation is simply a pass through of cost to its customers. However, favoritism of transmission and distribution investment may be a desirable corrective to the status quo, at least in the short term.<sup>293</sup> Particularly in Hawai‘i, regulators tend to believe that utilities currently underinvest in grid upgrades. The PUC has repeatedly exhorted the HECO Companies to accelerate their investment in “smart grid” technology, such as demand-response infrastructure and programming.<sup>294</sup> If Hawai‘i were to remove from the HECO Companies all hope of investing in future generation projects instead, the utilities’ strategists may well refocus their efforts to make the productive investments in such technologies that the PUC seeks.

### C. Public Control

The third and final category of incentives reform is in many ways the simplest: utility managers can simply be placed under the control of customers (in the case of a cooperative) or voters (in the case of a municipal utility). With this change in governance, it no longer matters how the utility is structured or how its rates are set. Governance reform will mean that utilities’ preferred extent of vertical integration and preferred rate design should accord with the interests of the customers or voters that control it.

On an international level, government ownership was the most common original response to the problem of natural monopoly in the electricity sector.<sup>295</sup> Even in the United States, there are more than 2000 municipal- and cooperative-

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flexibility and security than when the utility merely controls an IPP-owned asset. However, the HECO Companies did not provide any evidence in support of that argument, and long practical experience in Hawai‘i and elsewhere prove that it is entirely possible and safe for utilities to dispatch independently owned power plants.

293. See CHI-JEN YANG, *ELECTRICAL TRANSMISSION: BARRIERS AND POLICY SOLUTIONS* 5 (2009), <http://www.newworldcapital.net/wp-content/uploads/2014/02/Duke-University-Electrical-Transmission1.pdf>.

294. See, e.g., IRP Rejection Order, *supra* note 178, at Ex. A p. 13.

295. See *supra* Part II.D.

owned utilities, which account for about a quarter of total electricity sales.<sup>296</sup> The characteristics of these organizations are diverse. Municipal utilities and cooperatives are particularly prevalent in rural areas, but also exist in scattered urban municipalities. Publicly controlled utilities tend to be smaller in size than investor-owned utilities, but certain municipal utilities exceed the size of any of Hawai'i's utilities, such as the Sacramento Municipal Utility District,<sup>297</sup> the Los Angeles Department of Water and Power,<sup>298</sup> and Austin Energy.<sup>299</sup> Some municipal utilities own only “poles and wires” infrastructure, purchasing wholesale generation and transmission of electricity from other utilities and IPPs; however, other municipal utilities own generation as well.<sup>300</sup> Publicly owned electric utilities are usually not regulated, but sometimes are.<sup>301</sup> A diversity of governance frameworks also exists: some municipal utilities are government agencies directly controlled by municipal councils or executive bodies, while others have significant independence. The Sacramento Municipal Utility District in California is governed by an independent utility board elected by the utility customers, making it something of a hybrid between a municipal utility and cooperative.<sup>302</sup>

Perhaps the most interesting datum of all about publicly owned utilities is that their performance has been consistently superior to those of their privately owned peers over a period of nearly a century. Specifically, publicly owned utilities have offered rates on average 2–10 percent below the rates offered by privately owned utilities, in spite of the smaller average size of the publicly owned utilities—a challenging fact for those who believe that government is inherently less efficient than private enterprise.<sup>303</sup> Additionally, some customers

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296. See *Our Members*, AM. PUB. POWER ASS'N, <https://www.publicpower.org/our-members> (last visited Nov. 15, 2018); AM. PUB. POWER ASS'N, 2018 STATISTICAL REPORT 23 (2018), <https://www.publicpower.org/system/files/documents/2018-Public-Power-Statistical-Report.pdf>; AM. PUB. POWER ASS'N, <https://www.publicpower.org/public-power> (last visited Nov. 15, 2018); *Stats and Facts*, AM. PUB. POWER ASS'N, <https://www.publicpower.org/public-power/stats-and-facts> (publicly owned utilities service nearly 15% of electricity customers; rural cooperatives service nearly 13%) (last visited Nov. 15, 2018).

297. *Company Information*, SACRAMENTO MUN. UTIL. DIST., <https://www.smud.org/en/Corporate/About-us/Company-Information> (last visited Nov. 10, 2018).

298. *Facts & Figures*, L.A. DEP'T OF WATER AND POWER, [https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-power/a-p-factandfigures?\\_adf.ctrl-state=106qix4p72\\_38&\\_afzLoop=148324168485863](https://www.ladwp.com/ladwp/faces/ladwp/aboutus/a-power/a-p-factandfigures?_adf.ctrl-state=106qix4p72_38&_afzLoop=148324168485863) (last visited Nov. 10, 2018).

299. *Company Profile*, AUSTIN ENERGY, <https://austinenergy.com/ae/about/company-profile/austin-energy-at-a-glance> (last visited Nov. 10, 2018).

300. KWOKA, JR., *supra* note 81, at 2.

301. Paul A. Meyer, *The Municipally Owned Electric Company's Exemption from Utility Commission Regulation: The Consumer's Perspective*, 33 CASE. W. RES. L. REV. 294, 294 (1983).

302. *Our Board of Directors*, SACRAMENTO MUN. UTIL. DIST., <https://www.smud.org/en/Corporate/About-us/Company-Information/Board-of-Directors> (last visited Nov. 10, 2018).

303. KWOKA, JR., *supra* note 81, at 140–41; Paul Zummo, *Coast to Coast, Public Power Costs Less*, AM. PUB. POWER ASS'N (Jan. 3, 2018), <https://www.publicpower.org/periodical/article/coast-coast-public-power-costs-less>.

believe that municipal utilities and cooperatives are more responsive to customers.<sup>304</sup>

Hawai'i hosts one publicly owned utility, the Kaua'i Island Electric Cooperative, which was converted from an investor-owned utility to a customer-owned cooperative in 2002. Since cooperatization, KIUC has charged higher prices than the investor-owned HECO Companies, but this was also true of its investor-owned predecessor, and so may be explained by the utility's small size and investments than by its present governance.<sup>305</sup> More relevantly for the purposes of this Article, KIUC has more aggressively pursued Hawai'i's renewable energy goals than the HECO Companies. KIUC increased its renewable percentage of generation from just 5 percent in 2007 to 37 percent in 2017, successfully bringing significant new IPP-owned biomass, solar, battery, and small hydro projects online.<sup>306</sup> Two recent solar and battery projects set new benchmarks for low costs, providing time-shifted solar electricity during peak evening hours at rates lower than the nontime shifted projects HECO Companies procured via their contemporaneous solicitations.<sup>307</sup> Moreover, KIUC has been spared the contentious litigation and extraordinary project delays that have plagued the HECO Companies throughout the period. The PUC, which continues to regulate KIUC to a limited extent, has on several occasions compared the HECO Companies' performance unfavorably, and asked the HECO Companies to follow KIUC's example.<sup>308</sup>

The main objection to public ownership of utilities is, and has always been, more political or philosophical than economic or technical. For example, at the outset of the public-utility era, the debate over the relative merits of public ownership and regulation<sup>309</sup> was "heavy with overtones of the controversy about populism and socialism that dominated the era":<sup>310</sup>

The supporters of municipal control believed strongly in the efficacy of local government. Their solution to government corruption and inefficiency was not to remove important public decisions from politics but to educate the electorate. . . . The advocates of municipal control argued that democracy and efficiency were compatible, but the paramount goal was democracy. . . .<sup>311</sup>

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304. See KWOKA, JR., *supra* note 81, at 140–41.

305. KAUA'I ISLAND UTIL. COOP., KIUC ENERGY PLANS 7 (2008), <http://www.kedb.com/wp-content/uploads/2014/02/randy-hee-ppt.pdf>; Board, KAUA'I ISLAND UTIL. COOP. <http://website.kiuc.coop/board> (last visited Nov. 10, 2018).

306. See *Renewables*, KAUA'I ISLAND UTIL. COOP., <http://website.kiuc.coop/renewables> (last visited Nov. 10, 2018).

307. See *id.*

308. See, e.g., Commission's Inclinations, *supra* note 187, at 2.

309. See Delos F. Wilcox, *Effects of State Regulation Upon the Municipal Ownership Movement*, 53 ANNALS AM. ACAD. POL. & SOC. SCI. 71, 72–74. (1914); JOSÉ A. GÓMEZ IBÁÑEZ, REGULATING INFRASTRUCTURE: MONOPOLY, CONTRACTS, AND DISCRETION 177 (2003); George Stewart Brown, *Municipal Ownership of Public Utilities*, 182 N. AM. REV. 701 (1906).

310. KWOKA, JR., *supra* note 81, at 5.

311. GÓMEZ IBÁÑEZ, *supra* note 309, at 177.

Comparatively little attention was paid to more pragmatic considerations, such as the question of which type of utility would operate at lowest cost or inspire the best performance. A century later, our analysis of the advantages and disadvantages of government ownership of utilities has progressed little beyond that level. By and large, authors' treatment of the possibility of using "more government" to solve the problems of regulation is either dismissive or crudely polemical.<sup>312</sup> In the rare instances when pragmatic analysis of the costs and benefits of the public model has been conducted, it tends to reveal few concrete downsides. For example, in 2010, a Massachusetts commission concluded that "[r]easons against municipalization, *per se*, were not given, [though] some felt that the benefits of municipalization are either not evident or exaggerated."<sup>313</sup> A 2007 Connecticut Office of Legislative Research study reached much the same conclusion.<sup>314</sup>

In the recent consultant reports that have discussed the possibility of transforming Hawai'i's investor-owned utilities to private hands, three somewhat more concrete reasons for opposing municipalization and cooperatization have been expressed, but none are convincing.

First, concerns have been expressed regarding workforce issues. For example, a recent study commissioned by Maui County and conducted by a consultancy named Guernsey raises the specter that public-sector labor unions might make it difficult to attract and manage a workforce at an efficient cost.<sup>315</sup> However, Guernsey provides no comparative analysis of the efficiency of the state bureaucracy as compared to the HECO Companies' bureaucracy, nor any other concrete evidence to support this fear. Moreover, even if public sector unions are incompatible with strong utility performance, the problem could be easily solved by setting up the municipal utility as an independent entity not subject to state-government employment rules, as other major municipal utilities are.<sup>316</sup> Indeed, since public sector unions exist nationwide, Guernsey's speculation is contradicted by the evidence that municipal utilities perform more efficiently than their investor-owned counterparts.<sup>317</sup>

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312. Thus, in a thoroughly researched and exhaustively reasoned 1996 article on performance-based ratemaking, Peter Navarro explained simply that "regulation is the preferred form of intervention in America because it avoids the more socialistic option of government ownership of the industry itself." Navarro, *supra* note 204, at 117.

313. MASS. DEP'T OF ENERGY RES., MUNICIPAL UTILITY STUDY TECHNICAL REPORT 32 (2010), <https://www.mass.gov/files/documents/2016/11/oe/doer-municipal-utility-rpt.pdf>.

314. KEVIN E. MCCARTHY, MUNICIPAL VS. INVESTOR OWNED UTILITY ELECTRIC RATES (Jan. 2, 2007), <https://www.cga.ct.gov/2007/rpt/2007-R-0014.htm>.

315. Guernsey Report, *supra* note 24, at 14.

316. Similarly, Guernsey states that a "municipal utility would be subject to the County's existing public procurement laws," which "create inefficiencies when compared to private entities." *Id.* However, as described above, investor-owned utilities are also subject to procurement rules, and for good reason. See Competitive Bidding Framework, *supra* note 106. Moreover, if it is more efficient to relieve the municipal utility from such law, that could easily be accomplished by setting it up as an independent entity or passing legislation to exempt it.

317. See YANG, *supra* note 293.

Second, doubts are sometimes raised about the feasibility of financing the transfer of investor-owned utilities to public hands. The federal government provides low-cost financing to support the setup of cooperatives in rural areas, but this financing would likely not be available in most areas of Hawai‘i. Accordingly, it is likely that cooperatization or municipalization would require either the State of Hawai‘i or its counties to finance the acquisition of the utility with municipal bonds. In Guernsey’s analysis of the feasibility of municipalization on Maui, Guernsey concludes that while Maui County has an excellent bond rating that will allow it to borrow on tax-exempt municipal bond markets at low cost, debt service coverage ratios are a cause for concern:

[r]ating agencies look for a debt service coverage ration (DSCR) that is a multiple of the minimum amount necessary to meet annual debt service; while agencies differ in what they find acceptable, a coverage ratio of 1.25 is a reasonable target. The end result is that unless other financial subsidy is provided, the municipal utility would have to charge its customers a multiple of the actual cost of debt service in order to achieve the highest bond rating possible. In this specific application, Guernsey estimates that an electric utility owned and operated by the County of Maui would actually have to charge higher rates than those currently charged by MECO, with a significant driver being the debt service coverage ratio.<sup>318</sup>

However, Guernsey does not present any quantitative analysis, or explain whether or not it took into account the fact that a municipal utility’s ability to issue tax-free debt would lower its cost of capital by enough to offset the debt service coverage ratio problem it articulates. Nor does it explore potential solutions, such as the use of equity to reduce the amount of debt needed.

Finally, doubts have been expressed about the difficulties of the transition process between investor-owned utility and publicly owned utilities. The City of Boulder’s efforts to municipalize are sometimes used as a cautionary tale. Beginning in 2007, Boulder attempted to purchase electricity distribution assets located within its borders from an investor-owned utility (Xcel Energy) that serves 1.8 million customers in eight states.<sup>319</sup> Its plan was then to purchase renewable electricity for its distribution utility on wholesale markets.<sup>320</sup> When the utility refused to sell, Boulder attempted to condemn the assets using its power of eminent domain, but the court removed the matter to the Colorado Public Utilities Commission, holding that the Colorado Constitution gave the Commission jurisdiction over the question of whether municipalization should proceed.<sup>321</sup> According to one analysis, Boulder has spent over \$10 million pursuing municipalization, with nothing to show for it yet.<sup>322</sup>

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318. Guernsey Report, *supra* note 24, at 15.

319. Filsinger Report, *supra* note 24, at 28.

320. *Id.*

321. *Id.*

322. *Id.* at 33–34.

However, the Boulder experience would not likely be repeated in Hawai‘i, for several reasons. First, the Colorado PUC has power over the electricity sector under a broad delegation of authority set forth in the Colorado Constitution.<sup>323</sup> By contrast, the Hawai‘i PUC has a narrower statutory delegation of power. Accordingly, it is not certain that a Hawai‘i court would hold that the PUC’s jurisdiction trumps counties’ eminent domain powers, and even if it did, the Hawai‘i legislature would be free to overrule the decision. Second, because Xcel Energy serves customers both inside and outside of Boulder, any condemnation of its assets economically affects non-Boulder residents. This complication raises difficult questions, which would be appropriate for the PUC to resolve, rather than a judge presiding over an eminent domain proceeding. By contrast, transferring each of the Hawaiian Islands’ utilities to a municipality or cooperative would only affect residents within one county, without implicating any cross-border issues. Third, Boulder appears to be a highly renewable-friendly city situated within a less renewable-friendly state. As a result, Boulder could not rely on consistent state-government support for its effort. By contrast, as described above, Hawai‘i’s government strongly supports maximizing the use of renewable energy on a statewide level. Ultimately, any issues arising from a municipalization attempt in Hawai‘i—such as legal questions about relative jurisdiction of the PUC and counties, or about the valuation framework for eminent domain proceedings—could be simply addressed by the enactment of state legislation governing the transition.

In short, the transition from private to public control would require work, including legislation or litigation to clarify the relative powers of the PUC and counties, a municipal bond issue or other form of financing, and—if utility investors are hostile to acquisition—an eminent domain proceeding. However, there are well known precedents and frameworks for each of these steps. The complexity and novelty of implementation would therefore pale in comparison to the complexity and risk of designing performance-based rates or setting up an ISO-controlled system. If we can overcome our longstanding but largely unfounded philosophical qualms about public ownership of utilities, it offers a viable and attractive option for resolving incentive issues in Hawai‘i’s electricity sector. In particular, public control over utilities could be used to aggressively and efficiently execute Hawai‘i’s renewable energy transformation.

#### CONCLUSION

The conclusions of this Article can be concisely stated: The first decade of Hawai‘i’s long-term effort to decarbonize its electricity system has been disappointing and riddled with animosity. The principal reason for the slow

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323. COLO. PUB. UTIL. COMM’N, PROCEEDING NO. 15A-0589, DECISION NO. C-17-0750 27 (Aug. 30, 2017).

progress towards renewables is that Hawai'i electricity law encourages competition for the right to develop renewable energy projects, but the largest player in Hawai'i's electricity system—the utility—has a disincentive to support such competition. There are a number of potential solutions to this incentives problem, which can be divided into three categories: (1) rate reform, such as performance-based ratemaking; (2) structural reforms, such as mandated wheeling tariffs, the transfer of system control to an ISO, the divestiture of generation to form a TransCo, or newer “transactive energy” concepts; and (3) governance reforms, such as municipalization or cooperatives.

The reform options that have attracted the most interest in Hawai'i to date are performance-based rates, wheeling-based restructuring, and transactive energy-based restructuring for distributed energy resources, but these are not the best options. The same incentives problems that hamper the existing regulatory system are likely to frustrate efforts to determine effective performance-based rates. Engineering and economic constraints are likely to prove fatal to the wheeling, ISO, and transactive energy concepts.

Two alternative paths are more promising. The divestiture of utility-owned generation would convert Hawai'i utilities into “TransCos,” cured of the temptation to use their control over the transmission and distribution system to disfavor non-utility renewable generation. It would also refocus the utilities on smart-grid investments and allow the utilities to maintain the most efficient degree of vertical integration. Alternatively, the transfer of Hawai'i's investor-owned utilities to cooperative or municipal ownership would allow the utilities to be managed in a way that best pursues Hawai'i's renewable energy goals. The cooperative or municipality could then choose the degree of vertical integration, distributed energy interconnection policies, and rates that best advance those objectives. Implementation of Transco or public control reforms would thus position Hawai'i to make more progress during the second decade of its commitment to renewable energy than it has during its first.



