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Canberra, ACT's Renewable Energy Policy

A Review and Its Applications to Honolulu, Hawai'i

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Honors 330 (Honors Off Campus Study)
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This paper aims to identify lessons from Canberra, Australian Capital Territory's successful implementation of 100% renewable energy and apply it to Honolulu, Hawai'i's current renewable energy policy and practices. ACT is the first territory in Australia to achieve 100% renewable energy. Similarly, Hawai'i aims to be the first state in the United States to achieve 100% renewable energy. The method for comparison establishes critical components of a successful policy first. An overview of Australia, the ACT's, and Hawai'i's attitude and policy toward renewable energy follows. Lastly, this paper evaluates the successes of the ACT's policies against Hawai'i's current renewable energy atmosphere. The findings of this paper suggest further development of specific and intent-based policy plans for transparency, an increase of investment in large-scale utility clean energy generators, and a continued collaboration with other states to leverage clean energy culture beyond Hawai'i

Introduction

Renewable energy in present society is more than an environmental concern, the topic is also welfare-related, linked to energy security. A carbon crisis is nearing due to a shortage of nonrenewable energy supply and an increase in energy demand with a growing population (Zillman et al., 2008). The growing shortage of nonrenewable energy resources has been long known, and renewable energy technology is recognized by experts as the answer to the shortage (Sivard, 1981). Policy plays a key role in the development of renewable energy. This paper aims to review renewable energy policies in two

cities—Canberra, Australian Capital Territory (ACT) in Australia and Honolulu, Hawai'i in the United States—and identifies lessons Hawai'i can learn from as the state strives to reach its renewable energy goal.

THE IMPORTANCE OF RENEWABLE ENERGY POLICY

Policies must be in place to ensure the proper development of the energy market in prioritizing security and reliability in addition to sustainability. Due to the nature of renewable energy technologies, the cost will only significantly decrease with an increase in market size, which could be fueled by supportive policy (International Energy Agency [IEA], 2001; Mallon,



I am Eleanor Yuan, a student majoring in Global Environmental Science (BS) and Economics (BA). This paper was written for my HON 330 Honors Study Abroad class while I was in Australia on a Mānoa International Exchange program. With this publication, I aim to spark more conversation on the relevant issue of renewable energy policy. I hope to continue studying environmental issues and their impacts on society and to further my understanding of renewable energy systems.

2006). Subsidies, rewarding favorable behavior and encouraging technological development, seem to be the persisting method for governments to attain renewable energy goals (Zillman et al., 2008). Renewable energy is a long-term investment—policy working toward permanent change in climate requires 50–100 years of mitigation (Mallon, 2006).

The current atmosphere of global renewable energy policy is slow-paced mainly because mitigation efforts require dramatic long-term changes, whereas other issues such as those in the financial sector only require quick changes that yield immediate results (Busch & Shrivastava, 2011). Laws that lay out renewable energy policy must be planned well to account for true energy needs and long-term to be effective (Zillman et al., 2008; Mallon, 2006). In addition, confidence from legislatures must be placed in the renewable energy sector to meet demands (Simpson & Clifton, 2014; Mallon, 2006). The renewable energy sector must, in turn, trust the government to continuously invest and generate favorable policy (Simpson & Clifton, 2014; Mallon, 2006). It should be noted that the economy and current energy stakeholders play a large part in the amount of renewable energy on which a country depends. For example, if there are large amounts of domestically produced non-renewable resources such as fossil fuels, the country's share in the national and international market for those fuels will significantly affect the economic dependence of the country on those non-renewable resources (Zillman et al., 2008; IEA, 2001).

THE BASIS TO COMPARE HONOLULU AND CANBERRA

Canberra, Australia's capital, is housed in the Australian Capital Territory (ACT) and is home to approximately 396,000 people, comparable to the City of Honolulu's population of approximately 352,000 based on 2016 estimations (United Nation Data, 2019). Despite the amount of urbanization, Canberra encompasses many forests and nature reserves, earning it the nickname "Bush Capital." Honolulu also encompasses greenery and is surrounded by the ocean. As nature is very accessible in both places, and hence, the populations' perceptions of the environment are likely similar. Surfing is very prominent in Hawai'i and Australia, therefore, care for the ocean and its ecosystem is a core part of the culture. Ecotourism is a growing industry in both Hawai'i and Australia, where tourism is centered around the environment to enjoy natural systems with minimal anthropogenic interference.

Similar to Australia, Hawai'i has legislation preventing the use of nuclear-powered electricity generation, prohibiting the use of what some view as a stepping stone towards renewable energy (National Conference of State Legislatures, 2017). The ACT is the first in Australia to achieve 100% renewable energy, a title Hawai'i aims to claim in the United States.

However, there are key differences between the two cit-

ies and their respective regions. A large portion of the ACT population works for the public sector (42%), which is notably larger than Hawai'i's 20% government employees (Pianegonda, 2017; Department of Business Economic, Development & Tourism, 2018). A difference in the workforce population may result in a difference in the implementation of policy. The fewer workplaces outside the government there are to regulate, the easier a policy can be fully implemented. Furthermore, the ACT and Hawai'i are different geographically: Hawai'i consists of islands surrounded by the Pacific Ocean, while the ACT is a part of the Australian continent. This difference is very important as transportation (of materials, technology, and resources in general) is a greater obstacle in Hawai'i. Lastly, while both countries run on a democratic system, the general atmosphere of political opinion is contrasting. For example, in Australia, especially in the ACT, it is typical for communism and socialism to be discussed, whereas in America, those ideas would generally be seen as uncommon extreme ideals.

Canberra ACT's Renewable Energy

A BRIEF BACKGROUND ON AUSTRALIA'S ENERGY SYSTEMS

In Australia, environmental non-governmental organizations play a large part in convincing the public to make decisions with the environment in mind (Zillman et al., 2008). Large social movements such as the #StopAdani campaign (which aimed to prevent the building of Australia's largest coal mine), the Australian Youth Climate Coalition, and the Australian Conservation Foundation (comparable to the United States' Sierra Club) that span across Australia, show there is a strong presence of community support to move away from fossil fuels.

As Australia has one of the highest per capita energy consumption rates and the effects of climate change are present in the local environment, renewable energy policy has become a more pressing issue (Zillman et al., 2008). However, the richness of fossil fuels in Australia's geology, along with the country's strong history of dependence on non-renewable resources, present an obstacle for the Australian government (Zillman et al., 2008). An example of this challenge is the approval Adani received in 2019 to build the mine that the #StopAdani campaign attempted to block (Iyengar, 2019).

The challenge is to create policies at the federal level that set smaller obtainable goals, yet target the broad issue of climate change caused by carbon emissions, which contrasts with historical environmental policies focused on point-source pollution (Zillman et al., 2008). Point-source pollution is an externality from a known source, hence, the enforcement of regulation is simpler.

When Australia's Renewable Energy Target (RET) aimed to generate 45,000 GWh through renewable energy in Australia by 2020, the initial response of the community was negative:

a price decrease in renewable energy credits, possibly from the lack of practicality of this enormous goal (significantly greater than the previous 9,500 GWh by 2010 goal) (Parliamentary Library Web Manager, 2010). However, the Australian government acted to review and revise the legislation to provide more support (Parliamentary Library Web Manager, 2010). This anecdote is an example of a misstep by the government of releasing revisions to policy prematurely. Many policies, especially major ones, are typically released with more caution.

CANBERRA, ACT'S CURRENT RENEWABLE ENERGY STATUS

Anticipating public feedback, the ACT government clearly outlines its intent in published plans, which are put out for discussion and then revised before any laws or policies are further implemented (Environment, Planning and Sustainable Development Directorate [EPSDD], 2019). Transparency allows for the immediate execution of the proposed plan of policies once the plan is finalized. A renewable energy policy plan to map out ten years of policy for the ACT was first drafted in 2009 and finalized in 2011. In 2016, a 100% RET by 2020 was set by the government. The 2020 goal was a revision of the 100% by 2025 RET set in 2015 (Lawson, 2016). The ACT was able to follow a clear policy plan with 27 measures set in 2011 and develop an achievable RET in 2015 (Environment and Sustainable Development Directorate, 2011).

Australia's geography allows for various forms of renewable energy technologies, however, in the ACT specifically, those technologies have a limited application due to limited space and lack of coastline. The ACT is connected to a national energy grid that links much of eastern Australia which is primarily powered by coal—a fact critics of the ACT RET latch on to, as energy directly used by Canberrans are not necessarily generated from renewable resources because the renewable energy may be used elsewhere in the national grid (EPSDD, 2018; Evans, 2019; Groch, 2018). The ACT became “100% renewable” in September of 2019 through the government-run reverse auctions for renewable energy, government purchases of national RET shares produced from energy farms mostly located outside of Canberra, and individuals' rooftop solar panels (Evans, 2019; Environment and Planning Directorate, n.d.). After the ACT RET achievement, ACT policy now focuses on its net-zero carbon emissions goal by 2045, modified from the earlier goal of 2060, and maintaining 100% renewable energy (EPSDD, 2019).

Reverse auctioning was pioneered by the ACT within the Australian market, though this process has been used by others internationally for many years (Buckman, 2018). Reverse auctioning in renewable energy systems allows for the renewable energy generation projects to be granted to a competitive bidder who promises to build and maintain the renewable energy generator at a contracted price (Buckman, 2018).

In the ACT, this process was executed with transparency via a release of evaluation criteria along with its weighting for the decision (Buckman, 2018). Bids were sealed and a contract-for-difference payment structure was used to ensure fair competition and a consistent payment plan for the government; where the difference between market price and the set price is paid by the contractor when the set price is higher or the government when the market price is higher (Buckman, 2018).

The implementation of the ACT RET was well on its way with well-calculated energy usage estimations. Canberrans would need to pay an addition of about 5,50 AUD (approximately \$3.85 USD) a week to maintain the system (EPSDD, 2018). In the end, Canberra achieved its 100% energy goal mainly by buying large-scale renewable energy production farms and by incentivizing residents to install rooftop solar panels (EPSDD, 2019).

FUTURE STEPS TOWARDS SUSTAINABLE ENERGY USAGE

To disconnect from the national energy grid mainly fed by coal mines, the ACT would face barriers such as a substantial investment of resources and the maintainability of 100% renewable energy. As mentioned before, the ACT is very small. Therefore, there is a limit to the amount of available space for optimal renewable energy sites. Even if electricity generation was managed, the storage of the electricity would present a large problem. Currently, battery technology is not optimal for vast amounts of electricity. Research and development of better batteries, which many Western and Asian countries, private companies, and academic institutions are currently exploring, would require more investment from the Australian government (Brown, 2013; Boom, 2018).

Hydrogen fuel cells seem to be high contenders for optimal electricity storage. The hydrogen fuel cell uses water, hydrogen, and hydroxide to store potential energy through bonds of the atoms to release electricity without releasing any greenhouse gases. The byproduct of hydrogen fuel cells is water—harmless to the environment (Mallon, 2006). However, hydrogen fuel could be generated from hydrocarbons, such as oil, and hence would release a significant amount of greenhouse gasses if not sourced ideally (Mallon, 2006). There are already commercial cars and buses globally with this technology because of the potential. For instance, the Tokyo 2020 Summer Olympics planned to use hydrogen fuel to power much of the event's activities (Hornyak, 2019).

Current limiting factors of the hydrogen fuel cell are financial feasibility, lack of appropriate infrastructure, the expense of additional research and development to reduce costs and increase efficiency, and safety concerns surrounding the high flammability of hydrogen. The ACT government is attempting to improve the lack of proper infrastructure by introducing hydrogen fueling stations across Canberra and a fleet

of hydrogen-fueled cars for government usage, being the first territory in Australia to do so (Minister for the Environment, 2016). Moreover, Australia is in the works of creating a National Hydrogen Strategy to incorporate hydrogen into the current gas network, then move towards becoming an international supplier for hydrogen. According to a study by Queensland University, using hydrogen for energy is an idea that has the general support of the Australian public (Finkel, 2018; Lambert & Ashworth, 2018). Over half (52%) of survey participants supported hydrogen as an environmental solution (and 45% undecided) and about three quarters (77%) trusted that if hydrogen was used in Australia, it would be done safely (Lambert & Ashworth, 2018). Nevertheless, the public must be more informed about the use of hydrogen for energy, as Lambert and Ashworth (2018) found only 7% of those surveyed answered all five hydrogen-related questions correctly, and only 16% answered four questions correctly.

As public perception fuels policy, especially in a democratic country, it is important that an average citizen has general knowledge of policy and its effects. An example of public perception clearly influencing policy in Australia involves nuclear energy. In many parts of the world, nuclear power is the strongest contender in non-carbon-emitting energy, but, in Australia, nuclear reactors are banned by various laws in response to public protesting (Zillman et al., 2008; Sparrow, 2019). Research is still being performed on nuclear energy for academic purposes from organizations such as Australia's Nuclear Science and Technology Organisation; however, the research cannot be applied locally.

Honolulu's Renewable Energy

Hawai'i has been aware of the potential for renewable energy technologies on each island for decades (Department of Planning and Economics, 1981). In 1997, 6.4% of Hawai'i's energy use was sourced from renewable energy, with the top three sources being bagasse, municipal solid waste, and solar energy (Energy, Resources, and Technology Division, 2000). Nonetheless, little tangible policy regarding renewable energy was developed until 2008. Given Hawai'i's climate and location, many renewable energy sources are available, but the space to install the technologies, in the least invasive way to natural ecosystems and the most respectful way to indigenous peoples, remains an issue. There is momentum to move forward with renewable energy in Honolulu, especially after the implementation of the Hawai'i Clean Energy Initiative, which modified the original goal of 70% renewable energy by 2030 to a renewable energy portfolio standard (RPS) of 100% by 2045 (Hawai'i Clean Energy Initiative, 2017; Hawai'i Clean Energy Initiative, 2018). Hawai'i has been testing a variety of different renewable energy technologies ranging from wave and geothermal technology to hydrogen fuel cells (Hawaiian Electric Companies,

2019; Bliss, 2019). Renewable energy policy includes various state statutes which allow for the formation of various programs, including a Renewable Energy Technologies Income Tax Credit rewarding those who installed solar energy systems, and a Community Based Renewable Energy program allowing residents, without the capability to generate renewable energy at their own residences, to buy shares of a renewable energy facility (Department of Taxation, 2016). Policy goals range from encouraging new renewable energy technologies to decreasing energy consumption (Hawai'i Clean Energy Initiative, 2017). In addition, Hawai'i joined the United States Climate Alliance in 2017, promising to follow the guidelines set by the Paris Agreement regarding a reduction in greenhouse gas emissions (United States Climate Alliance, 2019).

Hawai'i is on track to meet its smaller checkpoints, according to Hawaiian Electric reports; however, O'ahu, where the City of Honolulu is located, is the furthest island from the 100% renewable energy goal (Hawaiian Electric Companies, 2019). As of 2018, there were 60 utility-scale renewable energy projects installed (Hawai'i Clean Energy Initiative, 2018). Other progress towards the 100% RPS was made via policies encouraging consumer-generated renewable energy and a reduction in energy usage through tax incentives and mandates. In 2008, Hawai'i implemented a solar heater mandate that required all new homes to be equipped with a solar water heater (Hawai'i Clean Energy Initiative, 2018; Mallams, 2019). Small-scale solar was the biggest contributor to renewable energy generation in 2018 (Hawai'i State Energy Office, 2019). In addition to action-oriented renewable energy policies, Hawai'i encourages various projects centered on clean energy such as mandating Hawai'i Community Colleges to offer energy systems and technology courses. Despite the numerous policy efforts since the introduction of renewable energy policy in 2008, some of the attempts have been undermined by granted exemptions and technical limitations (Mallams, 2019; Fares, 2015; Walton 2016).

Application of ACT's Policies to Honolulu

As seen, the ACT's renewable energy goal is more ambitious than Hawai'i's renewable energy target of 100% by 2045, although Hawai'i is the first state in the United States to set a renewable energy goal (since there is no nation-wide effort to reach 100% renewable energy dependence). In Hawai'i, energy security is a significant factor of the push towards renewable energy, due to the logistics (economic-, environmental-, and time-related) of importing oil across the sea. This contrasts with Australia, where a majority of the non-renewable fuel is sourced from within the continent. In spite of the need for more renewable energy technologies due to a lack of local non-renewable resources, Hawai'i is still behind in the renewable energy timeline.

All goals for renewable energy for the ACT were summarized in a policy paper for a set amount of years, which differs from Hawai'i's method of creating a working group to oversee renewable energy development. It would be logical to assume that simply having a working group could create more flexible goals and hence achieve a more efficient timeline to full dependency on renewable energy; however, that is not the case when comparing ACT and Hawai'i policies. The detail of the ACT's published renewable energy allowed for an efficient timeline that the ACT exceeded. A key factor to Australia's success is the proven system of reverse auctioning of large-scale utility projects outside of Canberra which made the projects economically achievable. An example of Canberra's success in renewable energy is the movement of projected dates years ahead of time. Furthermore, Australia's nationwide effort and commitment to a RET allowed for the ACT's policy to be effective, because there was more regulation around energy efficiency and all communities surrounding the ACT were ready for an increase in renewable energy dependency.

Hawai'i Clean Energy Initiative has four main goals clearly stated in the mission which are all-encompassing and reasonable. However, publicly setting more specific goals every few years with reasonable deadlines and statements of intent could speed up execution timelines. In 2016, Hawaiian Electric Companies released a Power Supply Improvement Plan, outlining clean power supply goals for each island (Hawaiian Electric Companies, n.d. a). A clear plan like the Power Supply Improvement Plan on a policy level could hold private and public parties accountable and encourage government transparency.

As Honolulu is isolated from other major landmasses, large-scale utility projects off-site are unfeasible. This isolation may affect the effectiveness of the reverse auctioning process. Hawai'i's government is familiar with the process of reverse auctioning with sealed bids, called competitive sealed bidding, as a method of procurement especially for large government projects. Hawaiian Electric also currently uses competitive sealed bidding for many renewable energy projects (Hawaiian Electric Companies, n.d. b). The barrier to the bidding process in Hawai'i is that non-local companies would need to be convinced to invest time into a project in the middle of the Pacific, whereas companies in Australia could offer their bids to other states. An increase in the number of large-scale utilities would speed up the process of achieving the targeted RPS, yet, more money must be invested from the government and transparency needs to be increased to avoid last-minute obstacles such as the protests against the wind farm in Kahuku (HNN Staff, 2019).

Unfortunately, convincing the United States to set a nation-wide goal for RPS is not likely. Thus, this last piece which helped Canberra reach its goals in a very timely manner cannot be applied in Honolulu's policy.

Conclusion

Canberra's success in achieving 100% renewable energy was largely shaped by the government's commitment and execution of policy via a detailed policy plan, contrasting with Honolulu's overarching program, which takes note of clean-energy focused laws as they are passed, summarizes annual clean energy data, and educates the public. Additionally, the ACT's comprehensive reverse auctioning process allowed for the government's investment in large-scale utilities to be financially achievable. Hawai'i may not be able to achieve the level of efficiency the ACT did under the reverse auctioning system, therefore, the level of investment and transparency of plans must increase significantly to speed up the process of developing large-scale utility systems. Lastly, Hawai'i must continue to work with other states in the United States Climate Alliance to generate political power in support of more sustainable practices and renewable energy.

Hawai'i's process towards achieving 100% renewable energy differs greatly from any other place due to its unique location of isolation combined with urbanization and a steadily growing population. To build on the current works of the state and county governments, applications can be drawn from different societies to apply parts of their successful plans. Canberra's renewable energy plan is one that emphasizes commitment and transparency, which has led to its prominent position in renewable energy in Australia.

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