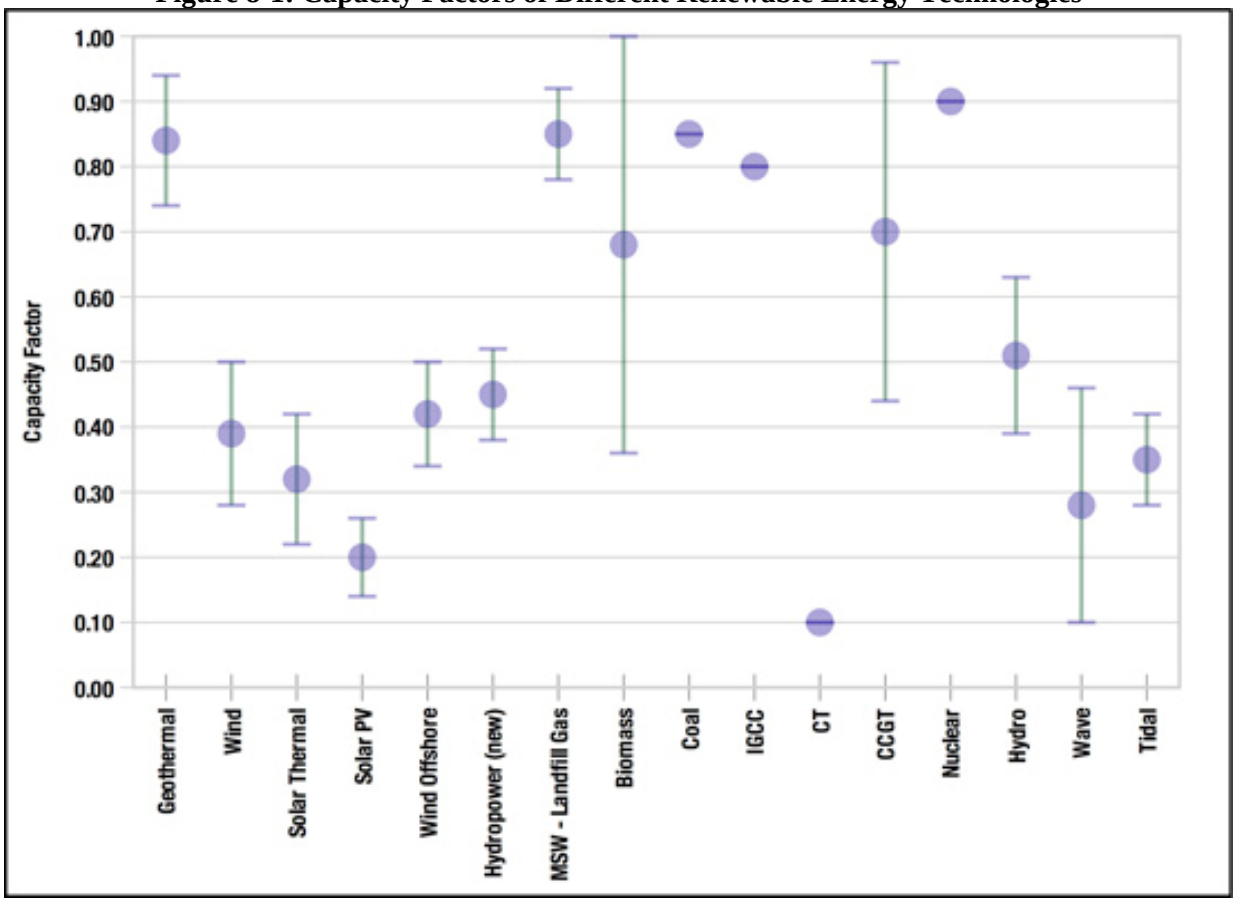
SECTION 8: WIND ENERGY CONSIDERATIONS

A. Acceptable Compromises to the Wind/Endangered Avian Species Impasse?

Onshore wind energy, on a technical and economic feasibility basis, is an attractive electricity resource for Kaua`i. Wind-generated electricity cost 38¢ per kilowatt-hour when the wind industry began in California in the early 1980s. Since then it has dropped to 4¢ or below at the best wind sites and some U.S. long-term supply contracts have been signed for 3¢ per kilowatt-hour. By 2010, wind farms at prime sites may be generating electricity at 2¢ per kilowatt-hour, making it one of the world's most economical sources of electricity.[1]

Technically, wind energy has a fairly solid capacity factor as seen in Figure 8-1 below from the National Renewable Energy Laboratory.[2] The capacity factor of a power plant is the ratio of the actual output of a power plant over a period of time and its output if it had operated at full nameplate capacity the entire time.

Figure 8-1: Capacity Factors of Different Renewable Energy Technologies



[1] Brown, L.R. (2006). *Plan B 2.0: Rescuing a Plant Under Stress and a Civilization in Trouble*. Chapter 10: Stabilizing Climate (NY: W.W. Norton & Co.). Retrieved on 9/8/10 from http://www.earth-policy.org/images/uploads/book_files/pb2ch10.pdf.

[2] National Renewable Energy Laboratory (2009). Energy Technology Cost and performance Data: Capacity Factor. Retrieved on 9/8/10 from http://www.nrel.gov/analysis/capfactor.html.

Regardless of the economic and technical benefits of wind, its development on Kaua`i has been essentially put on hold primarily due to federal regulations regarding the endangered Newell Shearwater and other endangered bird and mammal species (see Figure 8-2)[3]. Wind development on Kaua`i has also been put on hold due to some community and local opposition centering on visual impacts caused by wind turbines, as well as limited locations for development (the best potential sites are too remote). Kaua`i faces more stringent environmental restrictions due to its large populations of endangered avian species compared to the other Hawaiian Islands. Companies such as First Wind have addressed these same challenges on other islands. First Wind's Kaheawa wind farm, on the island of Maui, is located in a pristine natural habitat that is home to three endangered bird species, one endangered bat species, and abundant native plant species.

Figure 8-2: Endangered Avian Species in Kaua`i

The question of decentralized (or onsite, distributed, etc.) wind energy came about over the summer of 2009 as the Kaua`i County Council considered Small Wind Energy Conversion Systems (SWECS). When queried, the SENTECH Hawai`i Team endorsed the concept of small, onsite wind systems scaled for residential use—and the same endorsement would carry over to onsite photovoltaics, micro-hydro, etc.—but at the same time, the Team also cautioned that homeowners, developers, and the County should operate within the boundaries of Federal Endangered Species Act (ESA) regulations. To the best of the SENTECH Hawai`i Team's knowledge, federal regulations protecting endangered avian species such as the Newell Shearwater affect wind energy systems of any size, and as such, put wind developers and owners, and perhaps the County, at risk of running afoul of those regulations.

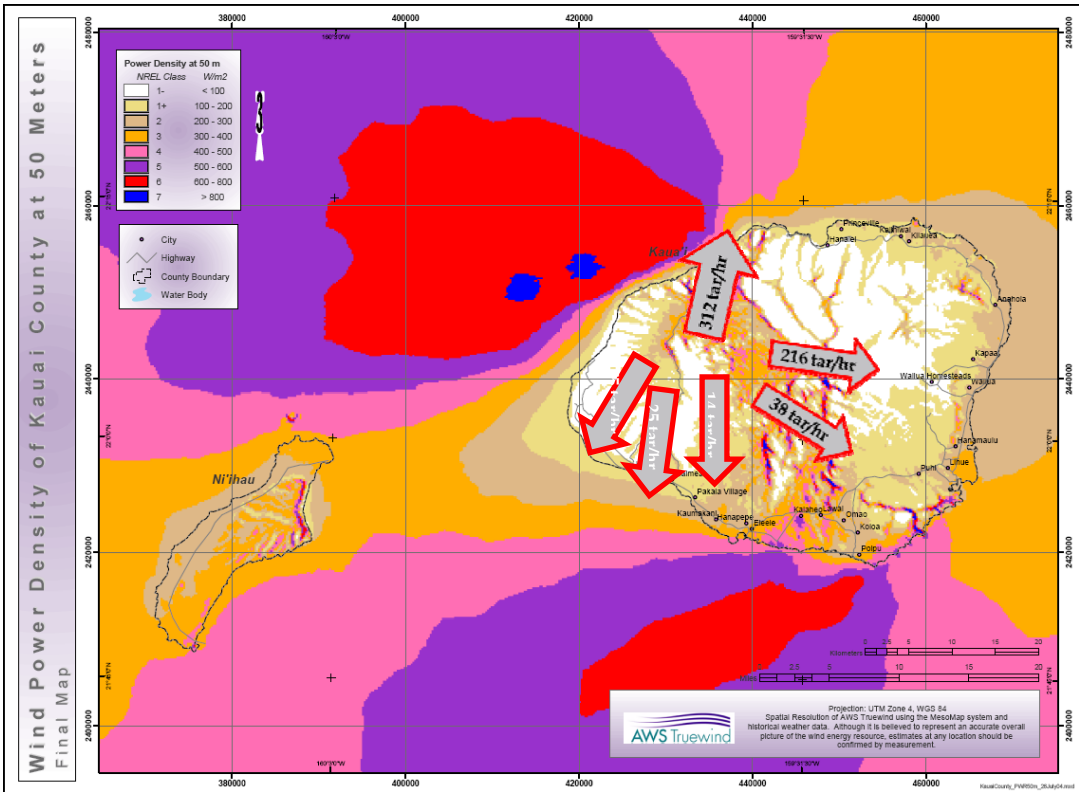
[3] Kauai Seabird Habitat Conservation Plan Office Presentation (given on April 6, 2009). Slide #4. Retrieved on 9/8/10 from http://www.kauainetwork.org/energy-sustainability/meeting-information/.

The County Planning Department is monitoring the wind regulatory environment for both small scale wind production as well as large utility scale production. Concerning small scale wind, the Department worked extensively on the small wind ordinance that was before the Council at the time of printing. Concerning large scale wind projects, meetings have been taken with a handful of firms intending to propose wind farms anywhere from 5 to 15 megawatts in size; however, said proposals have not yet materialized into official applications.[4]

A possibility remains that companies would be able to work with government agencies and local communities to implement successful solutions to the issues facing large wind projects.

- Figure 8-3 is a map overlaying wind resources on Kaua`i with one of Shearwater migration paths[5]. The Department of Forestry and Wildlife on Kaua`i developed this map at the request of the SENTECH Hawai`i Team. The map may add credence to the concept of micro-siting, or placing wind turbines in areas known not to have high migratory patterns.
- Another possible solution includes a mandatory Habitat Conservation Plan—underway in various versions—that would have a high replacement ratio for Shearwater takes from wind turbines or guy wires.
- A third possible solution includes altering the usual wind operational parameters, e.g., having the turbines shut down at night in early winter when Shearwater migration peaks and perhaps when electricity demand is low, such as at night.

Figure 8-3: Kaua`i Wind Resources with Shearwater Migration Paths



[4] Kaua`i County Planning Department. Personal Communication with: Doug Hinrichs (SENTECH Hawai`i Team). 2009.

[5] Kauai Seabird Habitat Conservation Plan Office Presentation (given on April 6, 2009). Slide #13. Retrieved on 9/8/10 from http://www.kauainetwork.org/energy-sustainability/meeting-information/.

Until and unless some of these or other solutions are realized, alternative wind technologies that may avoid the avian issues can be assessed.

B. Resource and Technology Update

The odds of developing offshore wind, because it could mitigate avian concerns on Kaua`i, are not high since the island's continental shelf does not extend out far enough, according to representatives of wind developers familiar with Kaua`i—but the County and developers should find firm data to confirm or deny this assertion.

Figure 8-4: "Hywind" Graphic

Another intriguing idea is to place wind turbines out to sea—where viewshed may not be an issue. In 2009, the world's first full-scale floating wind turbine, the so-called Hywind, pictured in Figure 8-4, was installed 10 km southwest of Karmoy, Norway. [6] The Hywind concept combines known technologies in a completely new setting and opens up the possibility for the wind industry to capture the wind energy within deep water environments.

The Siemens-manufactured 2.3MW Hywind turbine is the world's first full-scale floating wind turbine, and will be mounted on a 65 meter tower on the platform. The wind turbine is designed to be placed at ocean depths of between 120 and 700 meters. The floating structure consists of a steel jacket filled with ballast. This floating element will extend 100 meters beneath the surface and will be fastened to the seabed by three anchor piles.[7]

[6] Siemens (August 19, 2008). *Offshore parks with up to 200 stations.* Retrieved on 9/8/10 from http://w1.siemens.com/press/en/presspicture/pictures-photonews/2008/pn200819/pn200819-03.htm
[7] Renewable Energy World (June 9, 2009). *Hywind Floating Turbine Installed*. http://www.renewableenergyworld.com/rea/news/article/2009/06/hywind-moved-into-position.