

# **The Power of the Sea: Using Ocean Energy to Meet Florida's Need for Power**

*"Not only will atomic power be released, but someday we will harness the rise and fall of the tides and imprison the rays of the sun." — Thomas Edison<sup>1</sup>*

## **INTRODUCTION**

An increasing population combined with the ever-increasing number of electrical appliances in homes and businesses has caused the demand for electricity to skyrocket. The once perceived "convenience" of electricity is now considered a necessity and traditional power generation facilities struggle to meet these demands. Americans are a power hungry society, demanding conservation of natural resources and protection of the environment, while simultaneously using an incredible supply of electricity. In 2000, the per-capita average consumption of electricity was more than seven times as high as in 1949.<sup>2</sup> Despite our seemingly endless demand for power, society currently opposes the depletion of our nation's fossil fuels, an essential part of today's power production process. How can we satisfy this demand without depleting our fossil fuel supply? Renewable energy<sup>3</sup> may be our answer. On January 28, 2003, during his "State of the Union" address, President Bush stated: *"In this century, the greatest environmental progress will come about not through endless lawsuits or command-and-control regulation, but through technology and innovation."* This article analyzes wave power, a renewable energy source with tremendous power generation potential.

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<sup>1</sup> Thomas A. Edison (1847-1931), 22 August 1921; see University of St. Thomas Recycling Program, *Quotations on Energy/Alternatives* at <http://www.stthomas.edu/recycle/ENERGY.HTM>.

<sup>2</sup> See U.S. Dep't of Energy, *Energy in the United States: 1635-2000*, at <http://www.eia.doe.gov/emeu/aer/eh/elec.html> (visited March 25, 2006).

<sup>3</sup> Renewable energy includes solar, wind, biomass, ocean (including tidal, wave, current, and thermal), geothermal, and hydroelectric energy resources. See Energy Policy Act of 2005, Pub.L. 109-58, Title II (A) § 201, Aug. 8, 2005, 119 Stat. 594.

Although renewable energy encompasses a wide variety of alternatives, the possibility of harvesting wave energy may serve as a viable alternative source of electric power for coastal states such as Florida. Electric conversion of wave energy can be accomplished through the use of mechanical devices which either directly or indirectly drive a generator. In turn, this power is transported to shore via submerged cables and then connected to the power grid. This supply, coupled with today's technological advancements, may provide an endless source of energy for Florida.

This article evaluates why wave energy is a viable source of energy production and what steps must be taken to stimulate its development. It begins with an examination of the energy available from the sea, the various technologies available to capture this energy, and their relationship to the sustainability of electric power in Florida. To provide context, there is an examination of the environmental benefits of wave power versus existing fuels and emphasis is given to the local political atmosphere of Florida. The author then discusses the legislative action that must be taken to encourage the development of wave farms and finally, why consideration must be given to public concerns.

## **THE WAVE OF THE FUTURE**

Florida currently generates only one to two percent of its energy from renewable sources.<sup>4</sup> By utilizing the nation's second longest coastline,<sup>5</sup> Florida has the opportunity to lead the nation in its movement towards the use of renewable energy. To do so, state government must first take action by passing new legislation mandating at least 25% of the state's energy usage be derived from renewable sources no later than the year 2012. The state should take

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<sup>4</sup> Fla. Dep't of Env'tl. Prot. [hereinafter FDEP], *Florida Energy Plan* 15 (Jan. 17, 2006).

<sup>5</sup> Florida coastline is measured as 1,350 miles. It is second only to Alaska, which has 6,640 miles of coastline. See e.g., National Oceanographic and Atmospheric Administration, 1975; The National Atlas, *Profile of the People and Land of the United States Homepage*, [http://nationalatlas.gov/articles/mapping/a\\_general.html](http://nationalatlas.gov/articles/mapping/a_general.html) (visited April 14, 2006).

affirmative action by using new technology to harvest the world's most readily available resource – the energy of the sea.

The World Energy Council has estimated that the world's waves contain two terawatts of energy, the equivalent of twice the world's electricity production.<sup>6</sup> While not all of this energy can be harvested, preliminary surveys shows wave energy has a global potential of over 450,000 megawatts, representing a market of more than \$550-\$800 billion worldwide.<sup>7</sup>

Because Florida has 1,350 miles of coastline,<sup>8</sup> harvesting the energy of the sea is a practical way for the state to expand the use of renewable energy.<sup>9</sup> In Florida's 2003 *Assessment of Renewable Electric Generating Technologies*, limited consideration was given to the power that could be harvested from the ocean waves. In view of the fact that wave energy is one of the largest available renewable sources on Earth, it is imperative that future assessments of Florida's renewable sources include a more extensive evaluation of its potential.

To encourage technological developments, Florida's Department of Environmental Protection is currently administering \$5 million in grant funding to advance renewable and emerging alternative energy technologies for electricity generation.<sup>10</sup> Additionally, the *Florida Renewable Energy Technologies and Energy Efficiency Act*, which becomes effective on July 1, 2006, creates a renewable Energy Technology Grant program to provide matching grants for

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<sup>6</sup> 2 terawatts is equivalent to 2,000,000,000,000 watts is roughly the equivalent to the energy from 2000 large oil, gas, coal or nuclear power stations. See US Census Bureau, *No.945. Energy Consumption by End Use Sector: 1970 to 1999*, Statistical Abstract of United States, 2000, at 285.

<sup>7</sup> Solar Today News Network, *New Technology Alert: Electricity from Ocean Currents*, April 2000, at <http://www.solarquest.com/news/article.asp?id=899> (visited on March 28, 2006), and Ocean Waver Energy Conversion Proposal, at <http://www.owec.com> (visited, April 1, 2006) discussing prior wave energy conversion techniques

<sup>8</sup> National Atlas, *supra* note 5.

<sup>9</sup> Florida Coastal Management Program Homepage, at <http://coastalmanagement.noaa.gov/czm/czmflorida.html> (visited March 23, 2006). Florida has 1,350 miles of coastline and some 8,400 miles of tidally influenced shoreline.

<sup>10</sup> FDEP, *Florida Energy Plan 45* (Jan. 17, 2006), discussing generally recommendations for electric power generation.

demonstration, commercialization, as well as research and development projects relating to renewable energy technologies.<sup>11</sup>

## WAVE TECHNOLOGY

Through technological advancements, many companies are able to convert kinetic wave energy into mechanical energy that is then used to drive a generator. This energy is then sent to the power grid via submerged transmission lines.<sup>12</sup> Today, there are a variety of prototypes in operation across the world including the “PowerBuoy™”, the “Ocean Wave Energy Web,” and the “Pelamis” sea snake.

Ocean Power Technologies (OPT) utilizes independent ocean buoys to generate electricity.<sup>13</sup> Studies conducted by OPT indicate that installation of PowerBuoy’s™ in a 100 square mile farm off of the coast of California is likely to produce enough electricity for the entire state of California.<sup>14</sup> This translates into providing power to a population of 40-50 million people.<sup>15</sup>

Demi-Tek Incorporated’s, “Ocean Wave Energy Web” is currently in service off of the coast of Asbury Park, New Jersey.<sup>16</sup> This design uses an array of buoy’s to convert wave activity into electricity. The compact system, only 12' x 20' x 40', is reported to produce one megawatt of power.<sup>17</sup> The energy produced is then used to supply power to a public boardwalk and convention center.<sup>18</sup>

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<sup>11</sup> Fla. Stat. § 377.804 (April 3, 2006).

<sup>12</sup> Alice Hohler, *More than Just a Ripple*, reFocus, Jan/Feb 2005, at 54.

<sup>13</sup> Ocean Power Technologies, *Frequently Asked Questions*, <http://www.oceanpowertechnologies.com/faq.htm> (last visited April 22, 2006).

<sup>14</sup> Discovery Video, *PowerBuoy's in Action*, interviewing George Taylor, CEO, Ocean Power Technologies at <http://www.oceanpowertechnologies.com> (follow Discovery Channel hyperlink).

<sup>15</sup> *Id.*

<sup>16</sup> Ocean Wave Energy Converter, *Proposal: Prior Wave Energy Conversion Techniques*, at <http://www.owec.com> (follow proposal link, last visited March 23, 2006).

<sup>17</sup> *Id.*

<sup>18</sup> *Id.*

The largest system in operation today is the result of Ocean Power Delivery Limited's (OPD) innovation. In May 2005, Portugal began construction of the world's first commercial wave farm off the North coast of Portugal, near Póvoa de Varim.<sup>19</sup> The OPD wave conversion system called "Pelamis" or "sea snake" is a 450 foot segmented cylinder that utilizes wave motion to produce electricity.<sup>20</sup> The initial phase of the wave farm includes installation of three Pelamis devices with a capacity of 2.25 MW.<sup>21</sup> Once the entire project is complete, this wave farm is expected to product 24 MW via 31 Pelamis devices and is expected to meet the average electric demand of more than 1,500 Portuguese households.<sup>22</sup> The project cost per megawatt is only \$396,000 and the total cost of the project is approximately 9.5 million dollars.<sup>23</sup>

Unlike buoy's, the Pelamis is a semi-submerged structure composed of cylindrical sections linked by hinged joints.<sup>24</sup> The hydraulic motors located inside the hinged joints drive electrical generators which produce electricity.<sup>25</sup> Power from all the joints is then fed down a single cable to a junction on the seabed.<sup>26</sup> Several devices can be connected together and linked to shore through a single seabed cable.<sup>27</sup> OPD research has proven that sites best suited for their technology are locations where the waves have an average wave power level of 15 kW per meter.<sup>28</sup> Studies show that Florida's Atlantic coastline is an ideal location for Pelamis since the average wave power is at 19kW per meter.<sup>29</sup>

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<sup>19</sup> Press Release, Ocean Power Delivery Ltd., *OPD announces that it has secured the first order for Pelamis wave energy converters*, May 2005, at <http://www.oceanpd.com/LatestNews/default.html>.

<sup>20</sup> Ocean Power Delivery Ltd., [www.oceanpd.com](http://www.oceanpd.com) (last visited April 22, 2006).

<sup>21</sup> *Id.*

<sup>22</sup> *Id.*

<sup>23</sup> *Id.*

<sup>24</sup> *Id.*

<sup>25</sup> *Id.*

<sup>26</sup> *Id.*

<sup>27</sup> *Id.*

<sup>28</sup> *Id.* at <http://www.oceanpd.com/Resource/default.html> (visited April 1, 2006).

<sup>29</sup> *Id.*

Although the initial investment cost for many wave energy systems is anticipated to be more expensive than a fossil fuel plant, once built, they have low marginal energy production costs.<sup>30</sup> After all, there is no cost of fuel.

Another advantage of this technology is the energy density.<sup>31</sup> “While solar and wind systems are well-suited for remote off grid locations, ocean energy is ideal for large-scale developments in the multiple gigawatt range.”<sup>32</sup> Waves are more powerful and more predictable than wind, thus are more beneficial for coastal states. To put this in perspective, water is 832 times as dense as air thus providing a 5-knot ocean current with more kinetic energy than a 215 mph wind.<sup>33</sup> Additionally, in areas where detailed examinations have been conducted, the discovery of additional sites suggests that the kinetic energy in waves may be considerably larger.<sup>34</sup> The costs associated with systems such as Ocean Power Technologies, PowerBuoy’s<sup>TM</sup> range from 3 to 4 cents per kilowatt-hour.<sup>35</sup> Which is competitive with the 4-6 cents per kilowatt-hour costs associated with traditional fossil fuel plants.<sup>36</sup>

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<sup>30</sup> *Id.*

<sup>31</sup> The costs of harvesting wave energy are often compared to the costs associated with wind farms. The developments for wind energy are now reaching optimal production technologies while the developments for wave energy is 15-20 years behind that of wind. Energy is available from waves upward of 80 percent of the time, compared to 45 percent or less from wind, leading to more efficient scheduling for other energy sources on the grid. This is because energy production via wind farms is highly dependent on the wind velocity at the site. Florida’s average wind speed is only 12-14 miles per hour; translating into a 5 percent capacity factor and results in a cost of 57 cents per kilowatt-hour. Despite wind power’s low ranking for Florida, it is feasible in many other states as proven by the national range of 9-16 cents per kilowatt-hour. However, there are indications that in the future the use of wind power may be a more viable option for Florida due to expected technology advancements. *See e.g.* Alan Wallace, *Oregon Moving to Center of Wave Energy Development*, Feb. 1, 2005; *See also infra* note 40 at 51; Ocean Power Technologies, *Technology Comparison*, *supra* note 16.

<sup>32</sup> *New Technology Alert: Electricity from Ocean Currents*, Solar Today News Network at <http://www.solarquest.com/news/article.asp?id=899> (last visited March 22, 2006).

<sup>33</sup> *Id.*

<sup>34</sup> *Id.*

<sup>35</sup> Ocean Power Technologies, *supra* note 13.

<sup>36</sup> School of Physics at the University of Melbourne in Australia, *Alternatives to Nuclear Power*, ¶ 16, 2006, at <http://www.nuclearinfo.net/Nuclearpower/WebHomeComparisonOfEnergySources> (last visited April 2, 2006).

Employment of these technologies off of the coast of Florida is likely to serve a key roll in the environmental sustainability<sup>37</sup> for the state. How can Floridians continue to live with today's comforts and how can the state continue to accommodate rapid growth, without causing future generations a poorer quality of life? It is fair and just that today's society take steps to embrace the use of new technology and continue pressing forward with innovative ideas. While there is tremendous potential for the use of wave energy worldwide, ocean power technology is superbly practical in Florida due to its extensive coastline. For decades, the waves of Florida have supported state economics by attracting millions of tourist to the state each year.<sup>38</sup> These same waves are able to provide Floridians a clean source of power at a very low cost. From the examples above we see this technology is available and ready to be utilized. To embrace sustainability for Florida, the state cannot overlook the renewable resource of wave energy. The waves are persistently knocking at Florida's door, will someone answer?

### **WHY WAVES?**

While energy benefits are obvious, environmental benefits are an equally important reason to support and develop power production via wave energy. Certainly the number one reason for harvesting wave energy is that this is a truly clean source of power. Because offshore wave farms produce zero emissions, developing such farms will prove to be a big win for the environment.

Like many states, Florida's need for electrical generation is expected to grow by approximately fifty-eight percent between 2002 and 2020.<sup>39</sup> A typical Florida house will

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<sup>37</sup> "Sustainability can be defined simply as meeting contemporary needs without compromising the ability of future stakeholders to satisfy their needs." University of Florida, Office of Sustainability, at <http://www.succeednow.org/sustain/whatis.html> (visited April 14, 2006).

<sup>38</sup> In 2005, Florida had approximately 85.5 million visitors. See Visit Florida Research, at <http://media.visitflorida.org/about/research/> (last visited April 14, 2006).

<sup>39</sup> Florida Energy Plan 13, *supra* note 10, discussing generally Florida's ability to generate, transmit and distribute electric power.

consume about one megawatt hour (MWh) per month, but the house demand for electricity at any given moment will average about .0014 megawatt (MW) or 1.4 kilowatt (kW).<sup>40</sup> 2000 census data reports the existence of over 6.3 million households in Florida<sup>41</sup> and “according to a 2001 study by the U.S. Energy Information Administration, Florida ranks third nationally in total energy consumption.”<sup>42</sup>

### THE “EVILS” OF FOSSIL FUELS

Traditional power plants pollute the environment by spewing particulate matter, sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), mercury (Hg), and carbon dioxide (CO<sub>2</sub>), along with other contaminants, into the air we breathe. The environmental effects of these pollutants include the formation of acid rain, smog and haze, and contribute to global warming.<sup>43</sup> The public health effects of such pollutants include causing asthma, heart attacks, respiratory damage, and premature death.<sup>44</sup> It is known that “the average number of life-years lost by individuals dying prematurely from exposure to particulate matter is fourteen years.”<sup>45</sup>

Acid rain is formed when SO<sub>2</sub> and NO<sub>x</sub> react with water and oxygen to form acidic compounds. These acidic compounds return to the earth in the form of gas, particles, rain, snow, or fog.<sup>46</sup> “Smog is a brownish haze that usually appears over cities in summertime” and can

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<sup>40</sup> FDEP & Public Serv. Comm’n, *An Assessment of Renewable Electric Generation for Florida*, 1 (Jan. 2003). A megawatt (MW = 1000 kilowatts) is a measure of real power at any instant in time or, in other words, a measure of demand on the grid at any moment in time. Megawatt hours (MWhs) are a measure of the MWs demanded aggregated over some time interval and thus represents the amount of electric energy consumed.

<sup>41</sup> Florida statistics homepage, at <http://fl.rand.org/cgi-bin/homepage.cgi> (visited March 23, 2006).

<sup>42</sup> *Florida Energy Plan*, *supra* note 37, at 13; *see also* Energy Information Administration, *All Sectors and Total Consumption*, State Rankings 2001, at [http://www.eia.doe.gov/emeu/states/\\_seds.html](http://www.eia.doe.gov/emeu/states/_seds.html) (visited April 28, 2006) (Texas ranked number one in total energy consumption and California ranked number two).

<sup>43</sup> *See* Environmental Protection Agency [hereinafter EPA], *Clean Air Markets - Environmental Issues*, <http://www.epa.gov/airmarkets/envissues/index.html>, (last visited April 14, 2006).

<sup>44</sup> The Clean Air Task Force, *Dirty Air, Dirty Power, Mortality and Health Damage Due to Air Pollution from Power Plants*, at 9 (June 2004), citing Bascorn, R. et al., *Health Effects of Outdoor Air Pollution, Part I*, 153 *American Journal of Respiratory and Critical Care Medicine* 3-50 (1996). Available at <http://www.cleartheair.org/dirtypower/docs/dirtyAir.pdf> (visited April 14, 2006).

<sup>45</sup> *Id.*

<sup>46</sup> EPA, *supra* note 43.

impair visibility.<sup>47</sup> “The main component of smog is ground-level ozone, that is created when NOx reacts with other chemicals in the air, especially in the presence of strong sunlight.”<sup>48</sup> Additionally, “according to scientists, the Earth's surface has risen in temperature by about 1 degree Fahrenheit in the past century.”<sup>49</sup> Evidence suggests that this temperature rise is the result of greenhouse gases<sup>50</sup> in the atmosphere; primarily that of carbon dioxide (CO<sub>2</sub>), methane, and nitrous oxide (NOx).<sup>51</sup>

“EPA's own consultants estimate that fine particle pollution from power plants shortens the lives of 1,416 Floridians each year. Fine particle pollution causes 155,908 lost work days, 1,367 hospitalizations and 28,321 asthma attacks every year, 1,219 of which are so severe they require emergency room visits.”<sup>52</sup> “Based on EPA data, each year, 183 lung cancer deaths and 2,145 heart attacks in Florida are attributable to power plant pollution.”<sup>53</sup> Consequently, due to mercury contamination, Florida has advised against consuming fish from ALL of its rivers and lakes and all of its coastal miles.<sup>54</sup>

The U.S. Department of Energy has developed the Clean Coal Power Initiative program, in hopes of providing customers with power generation that is reliable, low-cost, environmentally sound, and efficient.<sup>55</sup> In 2005, as provided by this program, Curtis Stanton

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<sup>47</sup> *Id.*

<sup>48</sup> *Id.*

<sup>49</sup> *Id.*

<sup>50</sup> *Id.* (stating generally, Greenhouse gases trap heat that would normally escape back into the atmosphere, thus increasing the Earth's natural greenhouse effect and increasing temperature over time).

<sup>51</sup> EPA, *supra* note 43.

<sup>52</sup> Clear the Air, *Florida's Dirty Power Plants*, available at <http://www.cleartheair.org/regional/fl/> (last visited April 14, 2006).

<sup>53</sup> *Id.*

<sup>54</sup> Mercury is a toxic heavy metal, which, when ingested, can cause serious neurological damage, particularly to developing fetuses, infants, and children. 41 percent of the total mercury emitted by all known U.S. sources is the result of power plant emissions. *Id.* at 1.

<sup>55</sup> 70 Fed. Reg. 154, 46825, 46826, (Aug. 11, 2005); *see also* U.S. Dept of Energy, *Financial Assistance Announcement of Funding Opportunity, Clean Coal Power Initiative*, at 3, February 13, 2004, available at <http://e-center.doe.gov>. (Stating, “Under CCPI, the Government and industry would collaborate to demonstrate advanced

Energy located near Orlando, Florida, was selected as the location to be used for the construction of a full-scale Integrated Gasification Combined Cycle (IGCC) demonstration plant.<sup>56</sup> The total cost for the 285 megawatt unit is expected to be \$557 million which is equivalent to \$1.95 million per megawatt.<sup>57</sup> The Department of Energy awarded a \$235 million dollar grant to the Southern Company (the number-one utility emitter of NO<sub>x</sub>, SO<sub>2</sub>, and CO<sub>2</sub> in 1999)<sup>58</sup> in partnership with the Orlando Utilities Commission and Kellogg, Brown and Root, to develop the IGCC plant.<sup>59</sup> Although this project provides environmental improvements, dangerous emissions from this “clean coal” plant will not be completely prevented.

In 2005, Curtis Stanton’s existing unit one belched 6440 tons of NO<sub>x</sub>, 6059 tons of SO<sub>2</sub>, 64 tons of particulate matter and 320 tons of CO into the air of Central Florida.<sup>60</sup> Unit 2 emitted 2533 tons of NO<sub>x</sub>, 2764 tons of SO<sub>2</sub>, 77 tons of particulate matter and 373 tons of CO.<sup>61</sup> The Integrated Gasification Combined Cycle (IGCC) technology eliminates many but not all pollutants produced by use of coal. Although the amount of the pollutants is expected to be lower, the facility may still emit 5% sulfur dioxides, 1% oxides of nitrogen, 10% mercury, 75% carbon dioxide, and 0.1% particulates when compared to existing coal-fired plants that use coal containing up to 0.4% sulfur.<sup>62</sup> This facility will be constructed on an existing power plant site

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coal-based, power generation technologies that reduce barriers to continued and expanded coal use and that affirm technology readiness for widespread commercial deployment to provide clean, reliable, and affordable electricity.”).

<sup>56</sup> 70 Fed. Reg. 154, 46825, 46826, (Aug. 11, 2005).

<sup>57</sup> *Id.*

<sup>58</sup> Liz Hitchcock & Rebecca Stanfield, *New Campaign Calls on Southern Company to Be Clean Air Leader, Not An Obstacle*, April 3, 2001, National Campaign Against Dirty Power. Available at <http://www.cleartheair.org/proactive/newsroom/release.vtml?id=19880> (visited April 14, 2006).

<sup>59</sup> Press Release, U.S. Dept. of Energy, *DOE Awards \$235 Million to Southern Company to Build Clean Coal Plant*, February 22, 2006, available at <http://www.energy.gov/news/3241.htm> (visited April 14, 2006).

<sup>60</sup> Stanton Energy Center, *2005 Annual Operating Report for Air Pollutant Emitting Facility*, on file with author & Fla. Dep’t of Env’tl. Prot.

<sup>61</sup> *Id.*

<sup>62</sup> 70 Fed. Reg. 154, 46825, 46827 (Aug. 11, 2005).

which houses two coal-fired units, each rated at approximately 465 megawatts, and a natural gas fired combined cycle unit rated at approximately 633 megawatts.<sup>63</sup>

## GLOBAL WARMING

Through the Kyoto Protocol more than 150 countries committed to reducing greenhouse gases by 2012.<sup>64</sup> Carbon Dioxide (CO<sub>2</sub>) is one of the greenhouse gases known to contribute to global warming. Today, “CO<sub>2</sub> emissions are not regulated at the federal level, and, in 2004, power plant CO<sub>2</sub> emissions were 27 percent higher than they were in 1990.”<sup>65</sup> “In the absence of mandatory CO<sub>2</sub> emission limits, CO<sub>2</sub> emissions are rapidly rising. From 1995 to 2000, power plant CO<sub>2</sub> emissions from the 500 most polluting power plants in the nation increased by 13.5 percent, a total increase in annual emissions of 277 million tons.”<sup>66</sup> The new IGCC plant to be constructed in Orlando is expected to reduce carbon dioxide emissions by only 25%.<sup>67</sup> This small reduction is simply not enough.

The Environmental Protection Agency has determined that the Clean Air Act does not authorize carbon dioxide regulation.<sup>68</sup> In 2005, in response to the lack of regulation, various states and non-profit land trusts sued five electric utilities “for abatement of public nuisance of

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<sup>63</sup> *Id.* at 46826.

<sup>64</sup> US Department of Energy, *Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity*, at iii, October 1998, stating, “From December 1 through 11, 1997, more than 150 nations met in Kyoto, Japan, to negotiate binding limitations on greenhouse gases for the developed nations, pursuant to the objectives of the Framework convention on Climate Change of 1992. The outcome of the meeting was the Kyoto Protocol, in which the developed nations agreed to limit their greenhouse gas emissions, relative to the levels emitted in 1990. The United States agreed to reduce emissions from 1990 levels by 7 percent during the period 2008 to 2012.”

<sup>65</sup> Ceres, the Natural Resources Defense Council (NRDC) and the Public Service Enterprise Group (PSEG) *Benchmarking Air Emission of the 100 largest electric power producers in the United States – 2004*, at 10, April 2004. (The Benchmarking report facilitates the comparison of corporate emissions performance by combing generation data compiled by the Energy Information Administration with emissions data on sulfur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>), mercury (Hg), and carbon dioxide (CO<sub>2</sub>) compiled by EPA.)

<sup>66</sup> See generally Rebecca Stanfield, *Darkening Skies: Trends Toward Increasing Power Plant Emissions*, April 4, 2002 at <http://www.cleanairnow.org/cleanairnow.asp?id2=6275> (visited April 14, 2006).

<sup>67</sup> 70 Fed. Reg. 154, 46825, 46827 (Aug. 11, 2005).

<sup>68</sup> *Connecticut v. American Elec. Power Co., Inc.* 406 F.Supp.2d 265, 269 (S.D.N.Y. 2005).

global warming.”<sup>69</sup> The purpose of the *State of Connecticut v. American Electric Power Company* was to encourage the courts to establish carbon dioxide limitations on the five largest emitters of carbon dioxide in the United States, one of which is the Southern Company.<sup>70</sup> Unfortunately, the U.S. District court held that the suit raised non-justiciable political questions that were beyond the limits of the court’s jurisdiction.<sup>71</sup> The court found that “Congress has recognized that carbon dioxide emissions cause global warming and that global warming will have severe adverse impacts in the United States, but it has declined to impose any formal limits on such emissions.”<sup>72</sup> The court recognized that Congress, due to concerns over potential economic burdens, passed a series of bills that affirmatively barred the EPA from implementing the Kyoto Protocol.<sup>73</sup>

Not only are wave farms more economical than fossil fuels, their benign environmental effects are priceless. It is essential that Florida lead the Nation by protecting the environmental health of the State as well as the public health of all its citizens by changing existing power production habits. Wave power is economically feasible and awarding federal and state grants for accelerated commercial deployment of wave to energy facilities can encourage its development. When consideration is given to Florida’s extensive coastline and its high demand for power, it is obvious that the benefits of harvesting wave energy far outweigh those associated with either traditional coal/gas power plants or those associated with “clean coal” technology.

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<sup>69</sup> *Id.* at 265.

<sup>70</sup> *Id.* at 268. The complaints named American Power Company, Inc., the Southern Company, Tennessee Valley Authority, Xcel Energy Inc., and Cinergy Corporation as the five largest emitters of carbon dioxide in the U.S. *Id.* at 267.

<sup>71</sup> *Id.* at 265.

<sup>72</sup> *Id.* at 268-69.

<sup>73</sup> *Id.* at 269.

## “NO TO COAL”

Despite the need for increased power production due to population growth, proposed construction of traditional coal and gas-fired power plants also often meets with opposition from the customers they attempt to serve. The following few examples illustrate the entrenched opposition to coal-burning fuel sources.

A glimpse into the history of Gainesville Regional Utilities exemplifies the problems that power production facilities face across the Nation. During 2003, in Alachua county Florida, Gainesville Regional Utilities (GRU)<sup>74</sup> undertook preparations to meet their consumers' increasing demand for power. GRU's proposed solution included the construction of a 220 MW coal-fired power plant.<sup>75</sup> Citizens in Alachua County and the Alachua County Environmental Protection Advisory Committee (EPAC) quickly opposed it.

In September 2005, the EPAC reviewed the potential adverse health effects of air pollution from GRU's existing and proposed generators.<sup>76</sup> It concluded the most serious adverse air pollution effects are from fine particles emitted directly from the stacks and those produced in the atmosphere from sulfur and nitrogen gas emissions.<sup>77</sup> These particles, called PM<sub>2.5</sub>,<sup>78</sup> are known to cause heart attacks, asthma attacks, and episodes of difficult breathing among residents with emphysema or other chronic respiratory problems.<sup>79</sup> Increased death rates from respiratory and cardiovascular disease, increased hospitalizations, and more intense symptoms of respiratory

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<sup>74</sup> Gainesville Regional Utility is a municipally owned power generation facility

<sup>75</sup> Alachua County Environmental Protection Advisory Committee, *Review of the Gainesville Regional Utilities' Proposal for a New Coal-Fired Power Plant*, September 15, 2005.

<sup>76</sup> *Id.* at 1-3.2

<sup>77</sup> *Id.* The primary particulate matter and secondary particulate matter are collectively called PM<sub>2.5</sub> (particulate matter less than 2.5 microns in diameter). *See also* Clean Air Act 42 U.S.C. 7401-7671 (1967); 40 CFR 50-95 (2003). The Clean Air Act currently requires all PM<sub>2.5</sub> nonattainment areas and 8-hour ozone nonattainment areas to meet air quality standards by 2010.

<sup>78</sup> *Id.*

<sup>79</sup> Alachua County Environmental Protection Advisory Committee, *Review of the Gainesville Regional Utilities' Proposal for a New Coal-Fired Power Plant*, Section 1.3.2. Heath Effects of Pollution, September 15, 2005.

or cardiovascular distress have all been associated with short-term exposures to elevated PM<sub>2.5</sub> well below the concentrations allowed by existing ambient air quality standards.<sup>80</sup> Children, the elderly, asthmatics and those with other pre-existing diseases such as diabetes are more vulnerable to fine particulate pollution than other segments of the population.<sup>81</sup>

The citizens of Alachua County who share these environmental concerns joined together to create the Citizens for Affordable and Renewable Energy (CARE).<sup>82</sup> CARE voiced its opposition to the power plant both by presentations and by filling the audience at commission meetings with opponents in quiet protest.<sup>83</sup> In March 2006, CARE started a petition to allow residents to decide in the November 2006 election whether or not the plant will be built.<sup>84</sup>

Similarly, a citizen coalition called “Keep Madison Clean” was formed to protest against Jacksonville Electric Authority’s proposal to construct an 800 MWh coal-fired power plant in Madison County, Florida.<sup>85</sup> The coalition feared environmental degradation and adverse health effects resulting from potential emissions generated by the coal-fired plant.<sup>86</sup> “ Many physicians who specialize in asthma, pulmonary and pediatric medicines, as well as the American Lung Association, have issued public statements in opposition to coal-fired plants.<sup>87</sup>” Through its opposition, the citizens of Madison County articulated their desire to be more progressive and

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<sup>80</sup> *Id.*

<sup>81</sup> *Id.*

<sup>82</sup> Rob Brinkman, “*Put polluting power plant choice to a vote, group says*”, Feb. 2006, [http://www.afn.org/~iguana/archives/2006\\_02/20060201.html](http://www.afn.org/~iguana/archives/2006_02/20060201.html) (visited March 25, 2006).

<sup>83</sup> *Id.*

<sup>84</sup> *Id.*

<sup>85</sup> Jim Flournoy, *Coal-Fired Power Plant Not Welcome in Madison County*, Sept. 2005 <http://www.bigbendcat.org/MadisonCountyNo-To-Coal.htm> (visited March 23, 2006).

<sup>86</sup> *Id.*

<sup>87</sup> Wakulla County Commission Resolution, October 2, 2005, available at [www.bigbendcat.org/WakullaCountyNo-To-Coal.htm](http://www.bigbendcat.org/WakullaCountyNo-To-Coal.htm)

teach its citizens to use alternate energy.<sup>88</sup> In September 2005, The Madison County Commission passed a resolution opposing the construction of the proposed plant.<sup>89</sup>

Likewise, on October 3, 2005, the Board of County Commissioners of nearby Wakulla County passed a resolution in opposition to the potential construction of a coal-fired power plant. The Wakulla resolution conveys the County's opposition to the construction of a power plant within either the environs of Wakulla or those of nearby counties.<sup>90</sup>

### **“NO TO GAS & OIL”**

Even “Clean” fossil fuel is not without its opponents. Historically, not only have Floridians fought the construction of coal-burning power plants, they also battle proposed oil and gas exploration. Sixty-three percent of the energy in Florida is produced by power plants utilizing natural gas for energy production.<sup>91</sup> Not surprisingly, as a result of increased natural gas prices, Florida utilities continue to increase the customer rate.<sup>92</sup> In the past, Florida's citizens have refused to permit oil and gas exploration off of the coast and on February 1, 2006, Florida's U.S. senators, introduced the *Permanent Protection for Florida Act*, which would create a no-drilling zone extending 260 miles off Tampa Bay and 150 miles off Pensacola and Florida's east coast.<sup>93</sup> Unlike Coal, however, opposition to off-shore drilling is not as universal; those who support off shore drilling typically do so because they seek freedom from foreign oil. However, a desire for freedom from reliance on foreign fossil fuels through the use of wave energy is

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<sup>88</sup> *Id.*

<sup>89</sup> *Id.*

<sup>90</sup> Wakulla County Commission Resolution, *supra* note 86 (Stating that pollutants from Coal-Fired Power Plants present a danger of damaging the Wakulla River ecosystem and the Florida Medical Association has adopted policies articulating specific health hazards of environmental mercury.)

<sup>91</sup> Florida Energy Plan, *supra* note 10 at 15.

<sup>92</sup> Gainesville Regional Utilities, “*Conservation Can Offset Rise in Electric Bills*,” December 2005, at <http://www.gru.com/AboutGRU/NewsReleases/Archives/Articles/news-2005-12-30.jsp>. Stating that in December 1994, Gainesville Regional Utilities increased the customer rate as a direct result of increased natural gas prices.

<sup>93</sup> Mel Martinez and Bill Nelson, 109th Congress 2d Session. S.2289. February 1, 2006. “To prohibit offshore drilling on the outer Continental Shelf off the State of Florida.”

equal, arguably better, than offshore drilling from both an economic and an environmental perspective.

### **“JUST CONSERVE”**

Florida Governor Jeb Bush has said, “...the cheapest, easiest and fastest kilowatt we generate is the one we can save through efficiencies.”<sup>94</sup> The costs associated with power generation can be significantly reduced through active conservation programs. However, “conservation and energy efficiency programs are rarely greeted with enthusiasm by utility managers, owners, or even by city governments that own utilities. Why? The ability to obtain a profit and to collect enough revenue to cover fixed costs is tied to the volume of electricity sales for investor-owned utilities.”<sup>95</sup>

### **FEDERAL MANDATES**

When investor-owned utilities are profit driven, how can we demand continued movement in the direction of renewable energy? If they won't do it on their own, mandate it!

“On August 8, 2005, President Bush signed into law the first national energy plan in more than a decade. The President's national energy plan will encourage energy efficiency and conservation, promote alternative and renewable energy sources, reduce our dependence on foreign sources of energy, increase domestic production, modernize the electricity grid, and encourage the expansion of nuclear energy.”<sup>96</sup>

The federal “Energy Policy Act of 2005” requires the Energy Secretary to conduct an annual assessment of renewable energy resources.<sup>97</sup> This assessment will include an evaluation of

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<sup>94</sup> Governor Jeb Bush, “*Powering the Future Energy Conference*,” The Final Report of the Florida Energy 2020 Study Commission (Dec. 2001).

<sup>95</sup> Alachua County Environmental Protection Advisory Committee, Review of the Gainesville Regional Utilities' Proposal for a New Coal-Fired Power Plant, 1-4 (Sept. 15, 2005).

<sup>96</sup> Press Release, Office of the Press Secretary, *President Bush Signs Into Law a National Energy Plan*, August 8, 2005, available at <http://www.whitehouse.gov/news/releases/2005/08/20050808-4.html> (visited March 28, 2006).

<sup>97</sup> Assessment of renewable energy resources: a) Resource Assessment- Not later than 6 months after the date of enactment of this Act, and each year thereafter, the Secretary shall review the available assessments of renewable energy resources within the United States, including solar, wind, biomass, ocean (including tidal, wave, current, and

renewable energy including that derived through harvesting wave energy.<sup>98</sup> The assessment must also consider changing market conditions as well as the development of new available technologies.<sup>99</sup> Additionally, the Energy Policy Act has established a goal of 25 percent or more in efficiency of the use of energy by 2012 (when compared to the year 1990).<sup>100</sup> This encourages the development of new technologies so that the goal can be reached or exceeded.

Are goals enough? It's doubtful. The goals of the Energy Policy Act should be mandates. Furthermore, the Act should require each State to conduct annual assessments and establish their own measurable mandates.

It is time to correct the legislative mistakes made over the past 10 years. In 1992, President George Bush signed the "United Nations Framework Convention on Climate Change which brought together a coalition of countries to work toward a coordinated approach to the international issue of global warming."<sup>101</sup> In 1997, President Clinton signed the Kyoto Protocol, however the "Senate expressed misgivings over the prospect that the potential economic burdens of carbon dioxide reductions would be shouldered exclusively by developed nations, such as the United States."<sup>102</sup> Today we are left with the mere goals described in the Energy Policy Act. These goals must become mandates.

## STATE LEGISLATION

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thermal), geothermal, and hydroelectric energy resources, and undertake new assessments as necessary, taking into account changes in market conditions, available technologies, and other relevant factors. *See supra* note 3.

<sup>98</sup> *Id.*

<sup>99</sup> *Id.*

<sup>100</sup> "Each State energy conservation plan with respect to which assistance is made available under this part on or after the date of enactment of the Energy Policy Act of 2005 shall contain a goal, consisting of an improvement of 25 percent or more in the efficiency of use of energy in the State concerned in calendar year 2012 as compared to calendar year 1990, and may contain interim goals." *See Energy Policy Act* § 364, *supra* note 3.

<sup>101</sup> *See supra* 68 at 269.

<sup>102</sup> *Id.*; S.Res. 98, 105th Cong. (1997), Resolving by vote of 95-0 to urge the President not to sign any agreement that would result in serious harm to the economy or that did not include provisions regarding the emissions of developing nations.

By January 2003, fourteen States had State Renewable Portfolio standards in place, but only two states had established purchase mandates.<sup>103</sup> These sixteen states have taken steps in the right direction, however none have the defined goal or mandate of 25% improvement by the year 2012 as iterated in the Energy Policy Act.<sup>104</sup> Regrettably, as of March 2006, Florida had not established any clearly defined goal or mandate to mirror the Federal Act. During previous legislative sessions, debates arose as to whether the 25% reduction should be a state mandate or a state goal. Because no agreement could be made, this action quickly died.

“Since the 1970’s, the State of Florida has enacted at least twelve laws and numerous rules intended to promote the growth and development of renewable energy.”<sup>105</sup> The “2006 Florida Energy Act encourages and supports market-based development of reliable and cost-effective energy alternatives. Instead of mandates and taxes, the Governor’s strategy uses targeted incentives and government purchasing power to stimulate the free market and shape new technologies.”<sup>106</sup> This Act certainly presents incentives for the use and development of new technologies, however the question that begs asking is “Where’s the meat?” Without clearly defined goals or legislative mandates, private industries use their own discretion to decide if it is in the company’s interest to pursue alternative energy sources. In most cases, profit driven corporations will consider their own interests prior to taking action to advance the interests of the State. Without legislative guidance, it is difficult to sell conservation and the pursuit of renewable energy to big business.

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<sup>103</sup> See *supra* note 40, appendix B.

<sup>104</sup> *Id.*

<sup>105</sup> *Supra* note 40 at 65.

<sup>106</sup> Press Release, Russell Schweiss, *Governor Bush Unveils 2006 Florida Energy Act* (February 2, 2006), available at [http://www.myflorida.com/myflorida/eogadmin/showPress.jsp?press\\_id=7203](http://www.myflorida.com/myflorida/eogadmin/showPress.jsp?press_id=7203) (visited April 1, 2006). *Discussing generally*, recommendations focusing on economic incentives, diversity and conservation.

Florida House Bill 1473 was signed into law on March 5, 2006, creating the “Florida Renewable Energy Technologies and Energy Efficiency Act”.<sup>107</sup> This Act becomes effective July 1, 2006 and includes a provision to create the Florida Energy Council.<sup>108</sup> The council will provide advice to the Governor, the President of the Florida Senate, and to the Speaker of the Florida House of Representatives on the energy policy of the state.<sup>109</sup> Because Florida currently generates only one to two percent of our energy from renewable sources<sup>110</sup>, the council should immediately recommend legislation that clearly defines Florida’s desire to use renewable energy. This can be accomplished by either mandates or goals, but affirmative action must be taken to establish an expectation that at least 25% of Florida energy usage would be derived from renewable sources no later than the year 2012. This action must encourage the development of innovative technologically that utilizes the natural resources of the state, such as wave energy farms. Governor Jeb Bush has previously stated, “*By establishing Florida as the center for this ‘next generation’ energy technology, we are encouraging new corporate investment, creating new jobs and protecting the state’s air quality.*”<sup>111</sup> It is now time for our state government to take affirmative action by passing new legislation.

### **PURCHASING WAVE POWER**

The federal government is involved with state rate policies for energy producing facilities through the Public Utility Regulatory Policies Act (PURPA).<sup>112</sup> PURPA encourages alternative

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<sup>107</sup> H.B. 1473, 107th Leg. (Fla. 2006), available at [www.myfloridahouse.gov](http://www.myfloridahouse.gov).

<sup>108</sup> Fla. Stat. 377.804 (April 3, 2006).

<sup>109</sup> *Id.*

<sup>110</sup> *See supra* note 4.

<sup>111</sup> Florida Energy Office, *Governor Bush Unveils Hydrogen Energy Technologies Act and Breaks Ground on Florida's First Hydrogen Energy Station*, Feb. 18, 2005, Jeb Bush discussing the Hydrogen Energy Technology Act. Specifically in regards to emerging energy technology,

<sup>112</sup> 16 U.S.C. §2601 (1978).

energy sources by exempting them from many federal and state utility regulations.<sup>113</sup> PURPA also states that power from small renewable sources is to be purchased at the avoided cost for the utility.<sup>114</sup> Application of PURPA for wave energy farms means that the electricity produced by such facilities can be purchased by larger utilities at a rate equivalent to the avoided cost.

*Gainesville Regional Utilities v. Florida Power Corp.* addressed the issue of which utility will benefit from emergency interconnects between small electric utilities and a large power corporation.<sup>115</sup> In this case, Gainesville Regional Utilities (Gainesville) sought an interconnect with Florida Power Corp. (Florida Power) for emergency purposes.<sup>116</sup> After hearings, the Federal Power Commission entered an order requiring the interconnection be made.<sup>117</sup> Gainesville was directed to pay the entire cost of the interconnect and specific rates were established to be paid by each utility for actual emergency energy transferred.<sup>118</sup>

Florida Power appealed on the basis that only the small utility would benefit from such an interconnect and it should therefore be required to pay an annual fee to the large utility.<sup>119</sup> Although the Fifth circuit denied enforcement of the commission's order, the United States Supreme Court found that the order was valid and must be enforced.<sup>120</sup> The Supreme Court stated that there is substantial evidence to support the Commission's finding that the large utility will benefit from an interconnect with a small energy facility by way of "increased reliability of

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<sup>113</sup> Amy Abel & Jon Shimabukuro, *RS20146: ELECTRICITY Restructuring Bills: A Comparison of PURPA provisions*, CRS Report for Congress (April 7, 1999). Available at [www.ncseonline.org/nle/crsreports/energy](http://www.ncseonline.org/nle/crsreports/energy).

<sup>114</sup> *Id.* citing 16 U.S.C. § 824a-3(b).

<sup>115</sup> *Gainesville Utilities Dept. v. Florida Power Corp.*, 402 U.S. 515 (1971).

<sup>116</sup> *Id.*

<sup>117</sup> *Id.*

<sup>118</sup> *Id.*

<sup>119</sup> *Id.*

<sup>120</sup> *Id.*

service to certain customers, availability of additional reserve capacity during certain periods, and savings from coordinated planning as to efficient use of generating equipment.”<sup>121</sup>

While the federal regulations of PURPA require that energy produced from small power facilities be purchased for its “full avoided cost”, case law has established that large power industries receive a benefit from small energy facilities. The result is that large industries cannot prevent small facilities from entering into the energy marketplace. By utilizing these regulations in conjunction with case history, small wave to energy facilities are guaranteed a customer base in Florida.

## **PERMITTING AUTHORITY**

### **State Permits**

Harvesting the energy from ocean waves is beneficial to the public because it provides a clean supply of power to the state. One of the obstacles facing ocean energy planners is environmental permitting. Site certification can provide proposed facilities a streamlined application process in order to achieve compliance with multiple regulatory agencies. The State of Florida’s siting office coordinates the permitting for any electrical power plant that generates 75 megawatts or more in capacity.<sup>122</sup> The Siting Coordination Office (SCO) works in conjunction with the Office of General Counsel to issue site certifications and performs the administrative and legal tasks of the coordination process.<sup>123</sup> However, the Governor and Cabinet ultimately issue the license.<sup>124</sup>

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<sup>121</sup> *Id.*

<sup>122</sup> F.S. 403.506 (2006), Discussing applicability and certification.

<sup>123</sup> *Florida Electrical Power Plant Siting*, Fla. Admin. Code. Ann 62-17 (1999); Fla. Stat. 403.504 (1999).

<sup>124</sup> *Id.*; See also FDEP Siting Coordination, *Frequently Asked Questions*, <http://www.dep.state.fl.us/siting>.

The terms 'Permit' and 'Certification' are clearly defined by state statutes.<sup>125</sup> Permits are typically authorizations to construct or operate a facility that has the potential to cause harm to the public health or environment.<sup>126</sup> “They are governed by the protective standards and criteria established by statute or rule, they are media specific, valid for a fixed duration, and issued by an Agency Head. State, regional, and local permits may be required for any given facility.”<sup>127</sup>

Certification is basically an umbrella permit. “Certifications for energy facilities are defined by the siting acts to be facility-wide, covering almost every aspect of the facility as an all-in-one license, and are the sole state, regional, or local license required for construction and operation of the certified facility.” As such, the state pre-empts the issuance of any other type of permit for the facility, except for local zoning and building.<sup>128</sup> Certifications are granted for the life of the facility and are intended to protect the public health and environment, but it must also balance protection with the public benefit of a ready and reliable source of energy.<sup>129</sup>

Florida Department of Environmental Protection’s siting office is responsible for coordinating interagency reviews and certification for power production facilities.<sup>130</sup> Although, most proposed wave farms would not be required to apply for siting certification due to producing less than 75 megawatts, facility planners may voluntarily choose to obtain a siting certification.<sup>131</sup> There are many advantages of one-stop permitting, for instance, Section 403.50665, Florida Statutes requires that each local government file a determination with the

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<sup>125</sup> *Florida Electrical Power Plant Siting*, *supra* note 122.

<sup>126</sup> *Supra* note 123;

<sup>127</sup> *Id.*

<sup>128</sup> *Id.*

<sup>129</sup> *Id.*

<sup>130</sup> *Id.*

<sup>131</sup> Phone interview with Mike Halpin, P.E., DEP Siting Office, March 30, 2006.

siting office within 80 days after the application is filed.<sup>132</sup> Placing time restraints on the governmental agencies that have interests in the project provides assurance that the project will move forward at a reasonable pace.

A certification hearing, conducted by an Administrative Law Judge, must be held on every application, regardless of whether any matters remain in dispute. The hearing must be conducted no later than 300 days after a complete application is filed and notice of this hearing is published no later than 45 days before the hearing. Testimony and evidence will be presented, and agency staff may be called upon to be witnesses.<sup>133</sup> Prior to the hearing, interrogatories may need to be answered, and depositions may be taken.<sup>134</sup> The public may testify at this hearing, although oftentimes a special time is set-aside for this purpose, typically in the evening.<sup>135</sup> The hearings may last from a few hours to several weeks.<sup>136</sup>

### **Federal Permits**

Any proposed wave farm in federal waters off of Florida's coast will have to comply with State and local regulations prior to obtaining an appropriate federal permit from the Corp of Engineers. The outer continental shelf is subject to federal jurisdiction and control under the Outer Continental Shelf Lands Act ("OCSLA").<sup>137</sup> In Florida, the outer continental shelf<sup>138</sup> is

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<sup>132</sup> F.S. 403-50665(1) Land use consistency determination, effective date July 1, 2006.

<sup>133</sup> FDEP Siting Coordination, *Plant Siting Overview*, [http://www.floridadep.org/siting/Programs/Power\\_Plant\\_Siting\\_Overview.htm](http://www.floridadep.org/siting/Programs/Power_Plant_Siting_Overview.htm) (last visited April 28, 2006).

<sup>134</sup> *Id.*

<sup>135</sup> *Id.*

<sup>136</sup> *Id.*

<sup>137</sup> 43 U.S.C. § 1331.

<sup>138</sup> "Outer Continental Shelf is the submerged lands, subsoil, and seabed, lying between the seaward extent of the States' jurisdiction and the seaward extent of Federal jurisdiction. Federal jurisdiction is defined under accepted principles of international law. The seaward limit is defined as the farthest of 200 nautical miles seaward of the baseline from which the breadth of the territorial sea is measured or, if the continental shelf can be shown to exceed 200 nautical miles, a distance not greater than a line 100 nautical miles from the 2,500-meter isobath or a line 350 nautical miles from the baseline." Minerals Management Service, *Outer Continental Shelf Division homepage* at <http://www.mms.gov/aboutmms/ocsdef.htm>. See also, *Outer Continental Shelf Lands Act of 1953*, 43 U.S.C. § 1331 et seq; 43 U.S.C. § 1801 et seq.

located 9 nautical miles<sup>139</sup> off Florida's west coast and 3 nautical miles off of the east coast.<sup>140</sup>

Most wave energy technologies have an optimal performance in waters that are at 100 to 130 feet deep. The distance these systems will need to be placed from Florida's coastline will vary depending on the ocean topography around the state. If a system falls on the outer continental shelf it will be required by the Rivers and Harbors Appropriation Act<sup>141</sup> to obtain a federal permit from the Army Corps of Engineers. Nonetheless, federal permitting does not exclude states from exercising additional authority over the activities that fall on the outer continental shelf off of its coast.

The Coastal Zone Management Act (CZMA) requires activities permitted by federal agencies to be consistent with the coastal management program of an affected state.<sup>142</sup> The federal government manages natural resources on the outer continental shelf, while states simultaneously manage the resources off their coasts.<sup>143</sup> Through the Florida Coastal Management Program, Florida coordinates the reviews of activities proposed for the outer continental shelf.<sup>144</sup> Additionally, Florida's Office of Intergovernmental Programs (OIP) serves as the single point of contact for all matters concerning the outer continental shelf.<sup>145</sup>

One of the requirements of Outer Continental Shelf Lands Act (OCSLA) is compliance with the National Environmental Policy Act (NEPA).<sup>146</sup> NEPA documents required by OCSLA include Environmental Impact Statements and Environmental Assessments.<sup>147</sup>

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<sup>139</sup> 1 nautical miles equal 1.1508 statutory miles.

<sup>140</sup> *Outer Continental Shelf Lands Act of 1953*, 43 U.S.C. § 1331 et seq; 43 U.S.C. § 1801 et seq. *See also* Florida's OCSLA homepage at <http://www.dep.state.fl.us/secretary/oip/ocs.htm> (visited April 14, 2006).

<sup>141</sup> *Rivers and Harbors Appropriation Act*, 33 U.S.C. 403 (2000).

<sup>142</sup> Fla. Admin. Code Ann. 28-35.020 (2006); *see also* Florida's Office of Intergovernmental Programs, *Outer Continental Shelf Program Homepage*, [www.dep.state.fl.us/secretary/oip/ocs.htm](http://www.dep.state.fl.us/secretary/oip/ocs.htm) (visited on April 10, 2006).

<sup>143</sup> *Id.*

<sup>144</sup> *Id.*

<sup>145</sup> *Id.*

<sup>146</sup> *Id.*

<sup>147</sup> *Id.*

## AESTHETICS

One of the driving forces for opposition to harvesting the renewable energy of the ocean is public concern for aesthetics. Visual impact is often cited as a reason that many communities have opposed plans to develop power projects. To accommodate such concern, wave energy facility planners can choose sites that preserve scenic shorefronts.<sup>148</sup> Because a portion of the wave energy system is submerged, and the size is relatively small, it is doubtful a wave energy system would be visible from the shoreline. Furthermore, society is accustomed to the presence of buoy's in ocean waters due to their use in navigation and it is likely that the general population may not recognize the difference in an energy buoy compared with typical navigational buoys.

Ocean Power Technology's (OPT) PowerBuoy™ has the distinct advantage of only a minimal visual profile.<sup>149</sup> Only a small portion of the buoy is visible at even a close range since the bulk of the buoy is hidden below the water.<sup>150</sup> Because an OPT wave power station is normally located one to three miles offshore, the PowerBuoys are usually not visible with the naked eye from the coast.<sup>151</sup>

Recently there has been much debate over the construction of a proposed wind farm known as Cape Wind, near Cape Cod, Massachusetts. A thirty-year resident<sup>152</sup> of Martha's Vineyard, recently summarized the community's sentiment by stating: "I'm not against wind turbines. I'm against 130 of them over 400 feet tall right smack in the middle of one of the most

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<sup>148</sup> See *supra* note 40 at 38.

<sup>149</sup> Ocean Power Technologies, *Visual Impact homepage* at <http://www.oceanpowertechnologies.com/visual.htm> (visited April 1, 2006). Discussing the visual difference between offshore windmills and power buoy's.

<sup>150</sup> *Id.*

<sup>151</sup> *Id.*

<sup>152</sup> Dorothy W. Bisbee, *NEPA Review of Offshore Wind Farms: Ensuring Emission Reduction Benefits Outweigh Visual Impacts*, 31 B.C. Env'tl. Aff. L. Rev. 2 at 369 (2004). Quoting Pulitzer Prize-winning historian David McCullough,

beautiful places in America.”<sup>153</sup> NEPA regulations include consideration of aesthetics but this cannot dominate the review of the permit application.<sup>154</sup> Because the opponents are aware that an aesthetics argument alone will not stop the construction of Cape Wind, they have attempted other avenues to bring an end to the project.

For instance, the authority for issuance of a federal permit for Cape Wind was recently questioned in the case of *Alliance to protect Nantucket Sound, Inc v. United States Department of the Army*.<sup>155</sup> In the *Alliance* case, Cape Wind Associates submitted an application for a navigability permit under Section 10 of the Rivers and Harbors Act of 1899. This application was for the construction and operation of an offshore data tower in an area of Nantucket Sound located on the Outer Continental Shelf.<sup>156</sup> Section 10 delegates authority to the Corps to issue permits for projects that impact the navigability of United States Waters.<sup>157</sup> During August 2002, “the Corps issued a Section 10 permit authorizing Cape Wind to construct and maintain the data tower subject to the imposition of sixteen special conditions.”<sup>158</sup> “The permit was accompanied by an Environmental Assessment (“EA”) and Finding of No Significant Impact (“FONSI”), as required by the National Environmental Policy Act (“NEPA”).”<sup>159</sup>

One of the arguments made by the Alliance to Protect Nantucket Sound was that the Corps lacked authority to issue a Section 10 permit for the data tower.<sup>160</sup> The court determined that federal jurisdiction extends to: “all artificial islands, and all installations and other devices permanently or temporarily attached to the seabed, which may be erected thereon for the purpose

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<sup>153</sup> *Id.* Citing: Jennifer Peter, Associated Press, *Celebrities Protest Vast Wind Farm Proposed off Massachusetts Coast* (Aug. 12, 2003), available at [http://www.enn.com/news/2003-08-12/s\\_7414.asp](http://www.enn.com/news/2003-08-12/s_7414.asp) (last visited Dec. 31, 2003).

<sup>154</sup> *Id.* at 373, citing 33 C.F.R. § 320.4(a)(1).

<sup>155</sup> *Alliance to protect Nantucket Sound, Inc v. United States Department of the Army*, 398 F.3d 105 (1st Cir. 2005).

<sup>156</sup> *Id.*

<sup>157</sup> *Id.* at 107.

<sup>158</sup> *Id.* at 108.

<sup>159</sup> *Id.*

<sup>160</sup> *Id.*; 42 U.S.C. §§ 4331-32

of exploring for, developing, or producing resources therefrom, or any such installation or other device for the purpose of transporting such resources.”<sup>161</sup> The Court of Appeals determined that Congress’ intent for this clause was made clear in their conference report and that accordingly the court held that the Corps had jurisdiction to issue a Section 10 permit for Cape Wind’s data tower.<sup>162</sup> The judgment of the lower court in favor of the Corp of Engineers was affirmed by the United States Court of Appeals, First Circuit.<sup>163</sup>

It is also important to note that as discussed in the *Alliance* case, “A Corps permit does not convey any property rights...or any exclusive privileges. Furthermore, a [Corps] permit does not authorize any injury to property or invasion of rights or any infringement of Federal, state, or local laws or regulations.”<sup>164</sup> “Applications for [Department of Army] permits for activities affecting the coastal zones of those states having a coastal zone management program approved by the Secretary of Commerce will be evaluated with respect to compliance with that program.”<sup>165</sup>

## FISHING

Other arguments presented by the Alliance to Protect Nantucket Sound involve concerns that the wind farm may cause adverse effects on local fisherman who utilized the area.<sup>166</sup> Conversely, Oregon State University, in its development of energy buoys, has found different

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<sup>161</sup> 43 U.S.C. § 1333(a)(1) (2004); 398 F.3d at 109.

<sup>162</sup> *Id.* at 111.

<sup>163</sup> *Id.* at 115.

<sup>164</sup> *Id.* at 111.

<sup>165</sup> 33 CFR 320.4(h).

<sup>166</sup> Alliance to Protect Nantucket Sound, *FAQS: IMPACTS & EFFECTS: What Would The Impacts Of This Project Be On Fish And Fishing?* at <http://www.saveoursound.org/node/116> (visited April 16, 2006). “No fishing or boating group supports this project. Those who use these waters know the real effects this plant will have on the safety of navigation and fishing. The Sound is one of the richest fishing grounds on the east coast and a hugely popular recreation area. 130 turbines over 24 square miles will present significant obstacles to fishing, navigation and wildlife in all types of weather. Many local fishermen make up to 60% of their income on Horseshoe Shoal. This project would block off a productive fishing ground to a group of people already struggling to make a living; leading to why local and national fishing groups, including the 3000-member Massachusetts Fishermen’s Partnership, strongly oppose this project.”

results for wave energy projects and likewise, Ocean Power Technologies have determined their wave energy system to be beneficial to marine life.

Researchers at the Oregon State University (OSU) developed energy buoys that will “sit neutrally buoyant in the water, and will be almost impossible to see from land with the naked eye.”<sup>167</sup> The research team foresees powering the entire state of Oregon with a wave park comprised of an array of buoys, placed in an estimated 10 square mile area.<sup>168</sup> Although the design wards off public concern for aesthetics, the research team prepared to face opposition from local crab fisherman because Oregon's crab fleet has broken many harvest records in recent years.<sup>169</sup>

In order to encourage cooperation between the fishing industry and the wave park project, the University asked local fisherman for their input during early project planning. To their surprise, they learned the fisherman were excited about the prospect of producing clean, renewable energy.<sup>170</sup> By bringing the fishing industry into the project early, local fisherman were able to contribute their ocean expertise to the engineering of the buoys. Simultaneously project planners have learned how to avoid negatively impacting the local crabbing industry.<sup>171</sup> This harmonious relationship demonstrates how cross-industry cooperation can result in a benefit to all of the state's citizens. Afterall, clean, renewable energy contributes to the protection of the ocean thus protects the livelihoods of its fishermen.

The site development for Ocean Power Technologies (OPT) PowerBuoy includes preparation of a comprehensive Environmental Assessment (EA) before any construction phase

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<sup>167</sup> University of Oregon, College of Engineering, *The Power of Teamwork: Creating energy from Ocean Waves*, Annual Report 2005, available at <http://enr.oregonstate.edu/news/ar/2005/waveenergy.html>.

<sup>168</sup> *Id.*

<sup>169</sup> Lee Sherman, *OSU Engineers Are Working With Coastal Communities To Tap Offshore Energy*. *Sea Power*. Terra Vol.1 No.1 Spring 2006, page 3.

<sup>170</sup> *Id.*

<sup>171</sup> *Id.*

of the project.<sup>172</sup> “Great care is put in the planning and design phases to ensure there are no negative environmental effects.”<sup>173</sup> Additionally, the placement of the buoys does not prohibit fishermen from utilizing the waters around the buoy.<sup>174</sup> In general, OPT has found that their buoys act as an artificial reef and as expected, begins to attract more marine life to the area.<sup>175</sup>

### **IMPORTANCE OF WINNING PUBLIC SUPPORT**

In its wave park project, Oregon State University has found success by winning public support early in its project planning. As a general rule, the public perception of a project is based upon the trust of the players involved.<sup>176</sup> To win public support, it is necessary to listen to, and learn from all of the stakeholders who have an interest in the project. Failure to gain public support may result in the failure of alternative energy facilities to be constructed.

After the Kyoto Summit, the UK government pledged to address global warming by generating at least ten percent of its electrical power from renewable sources by 2010.<sup>177</sup> One of the renewable projects proposed in North Wiltshire involved the construction of a biomass to energy facility by Ambient Energy.<sup>178</sup> “The public in the UK are increasingly distrustful of government policy makers, industry, and other public bodies, while environmental non-governmental groups are seen as more trustworthy.”<sup>179</sup> The local people formed an action group to oppose the biomass to energy facility and as a result the North Wiltshire District Council

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<sup>172</sup> Ocean Power Technologies, *supra* note 13.

<sup>173</sup> *Id.*

<sup>174</sup> *Id.* Stating, in some parts of the world, conventional buoys are deployed to serve as "Fish Attracting Devices". Additionally, there is no effect on swimmers in the area of the buoy.

<sup>175</sup> *Id.*

<sup>176</sup> Bishnu Raj Upreti, Dan van der Horst, *National renewable energy policy and local opposition in the UK: the failed development of a biomass electricity plant*, 26 *Biomass and Bioenergy* (2004), available at [www.sciencedirect.com](http://www.sciencedirect.com) (visited April 14, 2006).

<sup>177</sup> *Id.*

<sup>178</sup> *Id.* “Ambient Energy Ltd. Proposed the development of a 5MW wood gasification plant near the town of Cricklade.” *Id.* at 61.

<sup>179</sup> *Id.* at 62.

rejected the application.<sup>180</sup> Although Ambient Energy appealed the decision, the appeal was dismissed.<sup>181</sup>

In the Wiltshire project, the misunderstanding between developers and the public caused the demise of the project. “It is clear that stakeholders had interpreted this development as being environmentally advantageous to all and blamed the opposition of engaging in typical NIMBY [Not-In-My-Back-Yard] behavior. However, the general public interpreted the development as solely serving the economic benefits of the developer.”<sup>182</sup> The lessons learned from this project emphasize the importance of winning public support.

As previously examined, the public stakeholders of Nantucket are in opposition to the construction of *Cape Wind* off of the coast of Massachusetts.<sup>183</sup> However, unlike the troubles facing *Cape Wind*, other renewable energy projects in the Northeast have found ways to encourage public support. Specifically, a 140 megawatt wind energy project proposed off the South Shore of Long Island, New York has the backing of environmental groups, the Governor of New York and the Long Island Power Authority.<sup>184</sup> Early in the planning phase, the Long Island Offshore Wind Initiative polled the public stakeholders so that they would be able to expeditiously address any concerns that might be raised.<sup>185</sup> They were pleased to find that the project had the general support of both the local stakeholders as well as the public.

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<sup>180</sup> *Id.* at 64, 65. The North Wiltshire District Council stated: “The Biomass Power station is a major development proposal which would, if allowed, seriously undermine the openness of the rural landscape, resulting in a loss of countryside creating an inappropriate form of major development in the Rural Buffer, contrary to the Wiltshire Plan Review and Policy.” *Id.* at 65.

<sup>181</sup> *Id.* at 66.

<sup>182</sup> *Id.* at 67.

<sup>183</sup> Andrew Miga, *Cape Cod Wind Farms Backers Target Congress*, April 20, 2006. Associated Press. Available at [http://www.boston.com/news/local/massachusetts/articles/2006/04/20/cape\\_cod\\_wind\\_farm\\_backers\\_target\\_congress](http://www.boston.com/news/local/massachusetts/articles/2006/04/20/cape_cod_wind_farm_backers_target_congress). Stating, “The alliance they formed includes 55 energy, labor and environmental groups and they are currently expressing their opposition to this renewable project by sending a joint letter to the members of Congress.”

<sup>184</sup> Press Release. Renewable Energy Long Island, *Environs Support Offshore Wind Park* (April 26, 2005). available at <http://www.lioffshorewindenergy.org>.

<sup>185</sup> *Id.*

The lessons learned thus far in the development of renewable energy facilities can easily be applied to any wave energy farm to be constructed off of the coast of Florida. To prevent a massive grassroots opposition, it is imperative to identify the stakeholders early and any concerns they have must be thoughtfully addressed. Without local support any wave to energy project runs the risk of failure.

## CONCLUSION

Due to its extensive coastline, harvesting wave energy is a viable source of renewable energy for the State of Florida. Technology and innovation has developed a variety of mechanisms that can be used to harvest the most abundant energy in the world, the energy of the sea. It is imperative that Florida take immediate action to prevent the continued degradation of human health and environment caused by emissions from traditional fossil fueled power plants. Implementing power production from a **truly clean** energy source will bring Florida forward as a leader in the United States and will set a positive example to the world.

Societal demands for power will continue to increase, thus it is essential that Florida mandate future power generation be derived from clean sources. Although federal goals are in place, without state mandates it is unlikely that Florida will work towards these goals. As a first step, the Florida Energy Council will be created in accordance with the 2006 Florida Renewable Energy Act. Without delay, this council must recommend to Florida's Governor, Senate, and House that affirmative actions be taken to establish renewable energy mandates for the Sunshine State. Additionally, wave power is economically feasible and the permitting processes are well established. Awarding state grants for the construction of wave energy farms can encourage its development in Florida.

Historically, the use of fossil fuels for energy production caused immense environmental degradation; we must now seek redemption by harvesting the energy of the sea.