THE ETHICS OF OFFSHORE WIND FARM DEVELOPMENT

Alex Johnson (amj92@pitt.edu)

INTRODUCTION

Coyne Power is a Tallahassee, Florida-based public green energy corporation known for its assets in the wind, solar, and geothermal energy sectors. There, I work as one of the head engineers in the wind energy department. New advancements in the electronics field of Smart Grids have led to the possibility of offshore wind farms being developed where power output could be greatly increased. For about five years, the wind energy sectors of companies such as Coyne Power have been stagnant; innovation had been hindered by the fact that onshore winds are not as reliable or as strong as those that are offshore. Essentially, the industry was waiting for technology to enable offshore development. That technology was Smart Grids. Now, Coyne Power is exactly on the cusp of this change, something that could revolutionize its standing as wind power provider.

How Smart Grids Enable Offshore Wind Farms

Smart Grids have become viable now because all components in a modern wind power plant are outfitted with Intelligent Electronic Devices (IED). These devices can both send and receive data regarding whatever component they are fixed to. The components can then be monitored by whoever owns them [1]. While the introduction of IEDs has greatly impacted the efficiency of power plant components, many IEDs still do not have the capability of communicating with one another. This is because many of the different vendors who make each component use specific data formats, meaning that different components do not have the ability to exchange their information [2]. The only way for all of these devices to work together in harmony is if they have some kind of common exchange model. A Smart Grid acts as a translator between all devices, allowing them smooth communication [2]. So now, for example, monitors outside an offshore wind turbine placed into the ocean might detect a change in the current. This information could then be corroborated with data from all of the other IEDs placed on nearby turbines and then sent back to an information center. From there, it could be assessed so that information telling the buoyancy control mechanisms on the turbine could make appropriate adjustments. This is crucial for the offshore turbine’s design. Because it is placed in water, there needs to be a sort of flexibility to the structure; it isn’t fully fixed to the ground, so it must be able to constantly adapt to the changing conditions. This sort of data exchange would also be vital for instances when certain components begin to fail or fail because a turbine could effectively be shut down before any harm is done to it.

The Dilemma: Signal Strength

As one of the wind energy department’s head engineers is my job to analyze and approve what course of action the company is to take with its newer developments. Unfortunately, I have noticed that our communication signals between the proposed offshore wind farm location, an area in the sea which is approximately six kilometers east of the southeast coast of Florida, and information centers on the shore may not be strong enough to ensure total safety and reliability. To reach a more stable signal strength, it would take another year of research and testing. But of course, offshore wind farms are a new development, something that investors want to capitalize on. Coyne Power is a public company, so to some extent, its business ventures go where the money goes. As a backup site, the corporation has also picked a plot of ocean that is about four kilometers south of the southern tip of Florida. Suitable wind conditions are found here and its distance from the shore is perfect for the signal strength that has been developed at this point. The only problem with this secondary location is that it is extremely close to the Florida Reef Tract, the third largest barrier reef in the world. The reef itself is protected by government mandates, but the wind farm’s proximity to it and the process of building the turbines themselves could seriously affect the ecosystem. Another option would be to simply build more units on land, although investors would likely move to put their money towards other sectors in Coyne like geothermal or solar energy – possibly even to another company. The heads of the Wind Energy sector have also put pressure on me to not let that money go to elsewhere, because if it did, their sector might begin to be phased out altogether. Surrounded by all of these options and circumstances, I as an engineer must use the codes of ethics that I know, knowledge, and the past experiences of others to decide the best course of action to take.

THE RESULTS OF DISHONESTY

My first option that I could take is to simply approve the signal strength of the communication relay between the offshore wind farm and the information center. There is a chance that the signal would always be strong enough between the two and that there never would be a problem. The chances of there being some kind of complication are also very likely though, and cannot be ignored. A failure of communication between the turbines and the onshore information centers is very likely to be disastrous as well. Ocean environments and currents are constantly changing, so if a turbine was not able to get the proper information regarding these conditions, its ballast system could very well fail, resulting in the loss of an entire turbine unit. Another less catastrophic result that could come about is that the turbine’s IEDs would pick up a change in wind direction,
which would send a message to the information center requesting clearance to pivot in order to be better oriented. If this message could not make it through, however, the turbine would just end up not being able to produce any energy. Although in this situation, the unit would still be intact, it is essentially useless, so from a business perspective it may as well not even be there. It is still money lost.

From an ethical perspective, approving the signal strength would simply be dishonest. According to the National Society of Professional Engineers (NSPE) Code of Ethics, “[e]ngineers shall be guided in all of their relations by the highest standards of honesty and integrity [3].” This NSPE Code is one of the most widely used ethical codes in engineering, and for good reason. It is a rather basic code, built to be universal for all types of engineering, but its contents are extremely important. Honesty, for example, is one of the most emphasized traits that an engineer must possess in this code. Most projects involving engineering contain many people that make up a chain that reaches from conception to a final product or result. If there is any dishonesty within this chain – which can end up being hundreds of people – there is a chance that the result not be the desired one [3]. In the case of making offshore wind farms, dishonesty about regarding the signal could potentially cause serious problems, whether they be catastrophic failure or inoperability.

A LOSS OF INTEGRITY

Instead of letting the turbines be built on the first choice site, I could approve their being built at the second location. This would have to be very delicately handled, as serious damage could be done to the nearby coral reefs. Even if the wind farm was successfully made without harming the Florida Reef Tract, there is still the unknown effect that the turbines’ proximity could have on it. Potentially, the turbines could harm the animals in this habitat, which would then have a cascading effect on the ecosystem [4]. For example, fish that populate just outside this coral reef such as the Gulf Red Snapper could begin to get caught in the turbine’s dynamic ballast system. These fish are crucial to the nearby coral reef, as they have a symbiotic relationship with some of the polyps that exist on its ocean beds [4]. These reefs are delicate ecosystems where even a minute change – something that the introduction of a wind farm may bring – could potentially create a substantial decline in the environment.

It is important to note that building this wind farm outside of the protected zone for the coral reef would not be illegal at all. The protected buffer area between unprotected sea and the actual reef is not actually that large, which is why the turbines could still have some effect [4]. As a company that deals in green energy, Coyne Power has established that it cares about the environment. Coral reefs are undeniably important ecosystems, not just for the surrounding area, but for the world at large. And that is not an exaggeration. Reefs serve to filter harmful pollutants out of the ocean and are home to thousands of species of fish, coral and sea-plants [4].

Even putting an environment such as this at risk – let alone damaging it – would ruin the credibility of the company. It would be going against the very goal that Coyne Power is aiming for, a cleaner, safer environment. A ruined credibility would spell disaster for investment money coming in, which could possibly even bring the entire company down with it. A similar situation to this even occurred when Suzuki Industries was met with huge backlash for just proposing to move onshore wind farms near an area of protected wildlife [5]. Not only that, but doing this would be violating the standard of integrity that green energy ethical codes such as the Distributed Wind Energy Association’s (DWEA) Code [6].

Nature from a Buddhist Perspective

As much as technology has elevated humanity, it is still a part of nature. Looking towards a philosophy such as Tibetan Buddhism, one can see that this idea is quite important to many people’s thinking. Speaking on nature, the Dalai Lama says:

“[U]ltimately according to Buddhist teachings the innermost subtle consciousness is the sole sort of creator, itself consisting of five elements, very subtle forms of elements. These subtle elements serve as conditions for producing the internal elements, which form sentient beings, and that in turn causes the existence or evolution of the external elements. So there is a very close interdependence or interrelationship between the environment and the inhabitants [7].”

This interdependence is something that cannot be severed. Therefore, harming the environment, only harms oneself. This is the same thinking that is behind the development of renewable energy sources just like wind energy. The link between man and nature only further stresses the disconnect that possibly irreversibly disturbing the environment in order to obtain renewable energy resources would illustrate.

HOW BUSINESS AFFECTS ETHICS

Rather than push for building offshore, I could conversely move to just put more assets towards onshore developments. Of all of the options so far, this one is seemingly the safest. Onshore wind farms have been made countless times already, so the chance of failure is extremely low; the turbines would also be located in a field or plain – not near some kind of fragile ecosystem such as a coral reef; even the cost of building turbines on land is lower [2]. But with pressure from the higher-ups to build something offshore, this option really is not possible. Pushing for this would most likely make me lose my job, and subsequently, someone else would be brought in to make the decision that I did not. So although, ethically, this may be a sound move to take, in reality it would not work at all. In the realm of business, where such huge
amounts of money are on the line, the lines between right and wrong become much more blurred.

**A DIFFERENT APPROACH**

Rather than approving any of the three previous options, I could opt to approve none of them, instead asking investors to patiently wait until signal communication technology between offshore turbines and onshore information centers is at a point where it is reliable for our situation. It would only take about a year to fully develop and test this technology to get it to the point where it needs to be. Time, unfortunately, is money, but if I can convince the investors that waiting could yield better profits with less risks, then things should move more smoothly.

**A Fully Operable Offshore Wind Farm**

The strongest benefit of offshore wind farms is the guarantee of fast, reliable wind. This means that, more efficient turbines can be used offshore to generate huge amounts of power. Onshore turbines can put out anywhere up to 5 megawatts in a day [1]. Many of these units have that capacity, but generally their output is less due to weak, unreliable winds. The prospect of much more power with a smaller footprint is what has truly caught the attention of many energy companies. In fact, Fuji Heavy Industries already has a new prototype turbine made for offshore use that can steadily put out over 8 Megawatts per day [2]. That would be a reliable source of nearly double the energy per unit. In other words, double the profits.

**ANALYZING ETHICAL CODES**

Generally, most codes of ethics are centered around the same values: honesty, integrity, adherence to high standards. Any other focuses in an engineering code tends to be specific to the field of engineering that a certain code is concerned with. But what exactly are honesty and integrity? As values, these things can be quite nebulous. From a religious lens, honesty and integrity walk hand-in-hand. The Dalai Lama, leader of Tibetan Buddhism, equates pursuing these values to “pursuing truth to one’s own nature, a noble ideal for humanity [7].” Elsewhere, countless other religions make the same emphasis as well. Christianity and Judaism, two of the world’s largest faiths, stress the importance of maintaining truth in oneself, going as far as to include this as part of their shared Ten Commandments [8]. These ancient commandments themselves are a code of ethics with many of its components being universally found in other ones.

**THE ACTION TAKEN**

Presented with four options each with their own pros and cons, I can only make one decision. I would undoubtedly choose to ask the investors to wait with their money. Convincing them that their patience could pay off would not be too hard, as the benefits seen by a fully operable offshore wind farm are tangible and backed up by numbers. Had the research time been any longer to develop a better signal strength, this decision would have been much harder. Potentially harming a coral reef would ruin the company; there is just no way that it could be done. Building immediately at the first site would certainly satisfy the investors, but it would be running the serious risk of throwing away my and the company’s engineering integrity.

Realistically, asking the investors to wait is the only way to give them the profits they want while staying at the cutting edge of technology and maintaining some sort of ethical code. Doing so may mean putting my job on the line, but tough decisions like this must be made. Engineers’ work does not happen in a vacuum. Their actions have profound, lasting effects on the lives of countless people. As builders of the future, they must recognize the responsibility that this presents and tackle it head on. After all, ethical dilemmas are simply just another aspect of the problem-solving that engineers thrive on.

**REFERENCES**


**ADDITIONAL SOURCES**

ACKNOWLEDGEMENTS

I would like to thank Stefan Burnet, Alex Drzewinski, and Nick Risotto for helping me write this paper and giving me a place of comfort and quiet.