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Amongst all of the Naval Horizons interviews I watched, I was particularly inspired and captivated by the concept of moving energy and power beaming as presented by Dr. Paul Jaffe. The idea behind power beaming is simple - sending energy quickly and wirelessly from one place to another via laser beam. However, the execution of this power beaming technology, and the implications of these advances on the Navy and Marine corps as well as the future as a whole, are quite remarkable.

Power beaming currently plays a large role in today's technological society, even though the concept itself has only been realized on a small scale. However, many forms of power beaming already exist, in the form of wireless charging, RFID, and in many biomedical applications. These forms of power beaming are quite stable and straightforward, however the more crucial applications are still in experimental stages. For example, power beaming over the long range, potentially in the aspect of long range wireless solar satellites, or even longer range wireless charging would have a very profound impact on our society, allowing us to develop breakthrough technologies that would enhance the lives of all around the world.

From my research on the topic, power beaming seems to have a few glaring issues that prevent it from reaching its full potential. For one, power beaming is very inefficient, with the highest entire system efficiency ever achieved being a paltry 25 percent efficient. With this loss in energy, it may be cost-prohibitive in most situations to use this power-beaming technology over conventional methods and power sources, so higher efficiency is needed to get widespread adoption.

Moreover, the necessity of a clear line-of-sight, meaning no obfuscation by clouds or other weather events for laser transmission limits the use cases, as these ideal conditions will not be present at all times and alternatives are needed. Finally, laser beam power transmission is limited by distance: the maximum range that is accepted is around 10 km, which is not enough to power some moonshot technologies such as solar satellites or long range power beaming to flying vehicles or spacecraft.

However, there are ways to solve these issues, all of which can be achieved within our lifetime, allowing for power beaming on a large scale to become a reality. For one, the issue of the maximum range of these power beaming lasers can be tackled by switching the laser to a more advanced type of laser called fiber lasers. Fiber lasers are lasers that are enhanced by using rare-earth elements, allowing for increased range, laser amplification, cooling, and output power. These fiber lasers are used in a range of real-world applications due to their technological abilities, of note the high photon conversion efficiency that can also play a large role in the future of power beaming technologies.

On the point of efficiency, the problem of overall system efficiency must also be addressed, as it hovers between 20-25%. One potential solution is the energy to light conversion of diode lasers in these systems hovers around 60%, a significantly higher mark, but many breakthrough groups such as Powerlight Technologies and DARPA SHEDS showed that these diode lasers can have as high as 85 percent efficiency on their own, raising the efficiency of the system as a whole significantly. Ultimately, these changes will have a strong, positive impact on the system efficiency of power beaming, allowing for widespread adoption in the future as this technology evolves.

Another great thing that I liked about the Naval Horizons videos were the scientists. Specifically, my favorite scientist was Dr. Karen Flack. What I primarily liked about her video in particular is how much

passion she had for her field of science: fluid mechanics. An already remarkable field, the way she explained it and showed the real-world applications and challenges that were faced in her field was thoroughly fascinating and thought-provoking. Her passion over the concept of biofouling got me excited about it, and in my free time I have explored fluid mechanics and have been captivated by it. Moreover, her career is quite inspiring to me and I aspire to get to a similar job one day; where I am able to come up with ideas for research and hypotheses with smart people, then get to build test rigs, run simulations, and ultimately work with my hands to test these hypotheses that will have a large impact on others and society as a whole.

My career goals lie in the intersection of space and robotics, two fields which I have been enamoured with since childhood. If I am able to combine these two fields in a career where I am able to take an active role in all aspects of research and development, similar to Dr. Karen Flack, and I am able to explore interesting questions and ultimately advance science and humanity as a whole, this is my ideal career. This is why I am so amazed by Dr. Flack's career, and aspire to achieve a similar career trajectory in the future; because she is having fun on the job every day and learning a lot in a field she loves.

On the topic of the future, power beaming technology has a limitless set of possibilities for the future. Firstly, for those who do not have easy access to energy, an example being in third-world countries, power beaming could play a crucial role in the steps towards upward social mobility for them, allowing them to develop more connected societies where opportunities for individuals are not limited by their milieu. Power beaming in these situations could be very useful if humanity develops an electricity infrastructure based on solar, where we put large tracts of solar panels on flat, uninhabited land or in the center of the ocean, and then beam this power to various, remote power stations that can support local communities, or even metropolitan areas when on a large enough scale.

Moreover, longer range power beaming could have an unthinkable impact on the Navy and Marine Corps today, as it would allow for energy to be sent to the battlefield wherever it would be needed, powering our increasingly green and electricity-based infrastructure. It would grant the Navy the ability to design cutting-edge ships and other technology, without the need to consider how the ship would be powered, allowing for more efficient ships that can carry more personnel and supplies. Additionally, strong and reliable power beaming technology would allow for a much quicker transfer of energy in situations where time is critical -- for instance on the battlefield -- saving lives that would otherwise have been risked to supply these troops.

Power beaming also has another notable future prospect: space travel. To put it simply, power beaming would quite literally revolutionize space travel. It would allow for lightweight spaceships, for example light sails, to avoid the weight of fuel and move quicker. This would go beyond the Marine Corps, beyond the Navy; with this technology, interstellar travel could finally be achieved, changing humanity forever. I am most interested in this possibility, as interstellar travel has always been my dream - and any technology that has the potential to achieve it gets my vote.

As a whole, the Naval Horizons videos have given me a deep insight into the professional world as well as the current states of many breakthrough technologies, and my career decisions and goals have definitely been impacted by these videos. For one, power beaming is a very interesting and important technology to our society - and I definitely see a bright future for it. I feel that power beaming is the

necessary technology at this crucial and defining moment in us as a society, as the impact of the implementation of power beaming in the context of green energy is immeasurable. Power beaming has a really strong benefit for the Navy and Marine corps as well, allowing them to keep troops safer, and to develop leaner and stronger ships that are able to accomplish tasks quicker and more efficiently. Regarding my career, I now aim to develop a career where I am in a position where I can quite literally change the world every day, and where I can have fun doing it too.