**EE 576 High Voltage :**

With an ambition to contribute to the wind energy sector, I was keen to gain a deeper insight into the transmission of electricity over large distances, particularly in offshore settings. This led me to enroll in Dr. Keven Burke’s High Voltage Engineering course, which was unique in its project-based structure, allowing students to explore their specific interests within the high voltage field.

The course was all-encompassing, addressing various elements of high voltage engineering and integrating discussions on current energy news worldwide. Each class included a segment dedicated to discussing recent energy sector news, often leading to insightful learning moments. The curriculum spanned a wide array of topics, from transmission lines to the high voltage properties of electrical components we had studied earlier. To further our understanding and appreciation of the subject, Dr. Burke introduced us to the historical context of energy production and its high voltage aspects, thereby enriching our educational experience.

While the coursework was stimulating, the primary focus was on our individual research projects, creating a research-intensive learning environment. I chose to research the High Voltage Direct Current (HVDC) Transmission of offshore wind turbines. This topic intrigued me due to the numerous benefits offered by offshore wind energy, making it an appealing choice for renewable energy generation.

Examining the HVDC transmission for offshore wind farms is crucial due to the consistent wind speed in these areas, which generates electricity. This electrical power is gathered and transformed into high voltage AC. For efficient long-distance transmission to onshore grids, it is then converted into HVDC using specific power electronic converters. The HVDC power is transmitted via undersea cables, engineered to endure severe marine conditions, linking the offshore wind farm to an onshore substation. At this point, the HVDC power is converted back into AC for integration into the existing grid infrastructure (**Figure1**). I have delved into various transmission methods, links, and configurations currently used in the industry, as well as emerging methodologies in the field (**Figure2**).

the utilization of HVDC technology for transmitting power from offshore wind farms, emphasizing its advantages over HVAC systems. It discusses challenges in integrating offshore wind energy into existing grids and highlights the impact of VSC-HVDC connections on power system stability and efficiency. The study underscores the importance of clear policies, supportive regulations, and innovative technologies for optimizing the reliability and efficiency of offshore wind energy integration.

The requirement for each student to create and present a topic to the class was an effective method to cover a wide variety of subjects in the high voltage engineering field. With over thirty students in the class, we had the opportunity to learn about many modern applications of high voltage. I appreciate having taken this course, as it provided a broad spectrum of fascinating topics within a single semester. This course acts as an excellent introduction to the high voltage engineering industry, offering students the liberty to focus on their most intriguing topics.

During the course, I learned that High Voltage Direct Current (HVDC) is more beneficial than High Voltage Alternating Current (HVAC) for long-distance transmission for several reasons. HVDC systems require fewer conductors and less insulation because they do not have AC losses. The lack of skin effect allows for the use of thinner conductors, resulting in more economical cables. HVDC systems also offer better stability and a wider speed control range. The absence of interference and synchronization problems makes it easy to interconnect with asynchronous systems, making HVDC a perfect choice for offshore wind farms.

A close-up of a power plant

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Figure 1: HVDC offshore transmission system

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Figure 2: Example : Viking Link (DENMARK-UK)

Citation :

Figure1: <https://energycentral.com/c/tr/biggest-challenge-offshore-wind>