UK Personal Statement Essay

While science has always satisfied my curiosities about the mysteries of the world, it is the ability to use these scientific discoveries that fascinates me. As a country reliant on domestic coal, I was excited to learn that Indonesia, my home country, had set a goal to achieve 23% renewable energy by 2025. This has motivated my desire to transform the fossil-fuel-driven country’s energy reliance through electrical innovations.

My interest in the concept of smart grids led me to complete a MOOC, where I was introduced to potential energy storage systems that could reduce wasted energy in a grid powered by renewables. I was intrigued by supercapacitors' ability to discharge and recharge quickly, which would enable them to deliver quick bursts of energy during peak power demand. As a result, they can quickly store the excess power that would otherwise be lost, thus making it a great candidate for future storage systems. While analysing the Digest of UK Energy Statistics, I was confused to learn that electrical demand in the UK was decreasing due to improvements in grid efficiency, but after interviewing an innovation engineer at the National Grid, I learned that this was due to an increase in grid efficiency, which contributes to the depletion of energy demand. I am optimistic about the potential of smart systems in the grid, which led me to focus my EPQ on this topic. I explored the impact of smart technologies on the sustainability and efficiency of a fossil-fuel powered grid. Unlike fossil fuels which can easily be ramped up and down, the variability of renewable sources currently poses an issue as the power can be wasted if not used immediately, leading to a frequency imbalance. However, I was surprised to learn that the restriction of renewables could sometimes be more economical than reducing the output of a conventional fossil-fueled power plant.

My work experience in a local Indonesian energy consulting company enabled me to further explore the grid. I used HOMER to model microgrid arrangements in rural Indonesian islands, analysing the cost and efficiency of each paradigm. By modeling 3 systems (diesel only, PV + diesel, PV only), I found that more often than not, the levelised cost of electricity is lower when renewables are being penetrated into the grid. To me, this was an optimistic indicator of the efficacy of renewable penetration. When using DIgSILENT to complete a load flow analysis, I explored the importance of choosing a suitable distribution voltage. For example, when working on an isolated grid on a residential island, there was no need to ramp the voltage up to the standard 20kV local voltage; 0.4kV was enough.

Furthermore, I earned gold in the DIDI Project Design Space Competition, where I worked in a team of 5 to create a product that would reduce water wasted during handwashing. Cooperation brought forth innovative solutions not thought of in isolation. At the design stage, I evaluated different mechanisms such as a bevel gear and a bell-crank linkage to convert horizontal motion from a motor to vertical motion. Only after discussions with the team did I realise that a bevel gear would require great precision in its placement to ensure its efficiency, something we may not be able to achieve at school. This experience also honed my ability to work through unexpected outcomes. For example, to analyse the product’s feasibility, I prototyped a full size model of the component by 3D printing and demonstrating it, where I realised the inconvenience of the initial idea which used a screw mechanism to enable users to adjust the fit of the product to the tap. Instead, I opted to use a silicon connector, which surprisingly was able to withstand the pressure of the tap, while also enabling the product to be portable due to the easy removal from the tap.

As a driven individual, I aspire to contribute to the development of electrical innovations to help alleviate climate change.