

Thesis Project Portfolio

Creating the “Abaclock”

(Technical Report)

**Electric Vehicles Are the Future:
Or Do They Have Too Much Baggage to Fly?**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
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Bachelor of Science, School of Engineering

John Thomson

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Department of Mechanical Engineering

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Sociotechnical Synthesis

Energy is a vital resource that plays a central role in Science, Technology, and Society (STS). As global populations grow and developing countries strive for progress, the demand for energy is always escalating. There exists a widespread belief that transitioning to clean energy sources, such as wind, solar, and nuclear coupled with efficient energy storage systems like lithium-ion batteries, will address the environmental challenges associated with fossil fuel energy production. However, it is crucial to critically examine emerging technologies and their potential disadvantages, both from social and technical perspectives.

My STS topic focuses on batteries, one of the most viable energy storage technologies. While batteries offer advantages like portability, high energy efficiency, and rapid charge and discharge time, they also pose notable environmental challenges as global storage capacity increases. The production and primary use of batteries contribute to a large carbon footprint, and their entire life cycle yields inefficiencies. Additionally, the lack of effective battery recycling methods exacerbates the environmental consequences. Through research and analysis, my aim is to shed light on these disadvantages, ensuring a comprehensive understanding of their environmental implications.

On the other hand, my technical project does not directly relate to energy storage. Instead, it focuses on addressing a different need within the mechanical engineering curriculum at the University of Virginia. The lack of substantial hands-on learning experiences prompted our team to undertake a project that would enhance our technical skills through practical applications. Our project involved designing and constructing an automated clock that displays time in the format of an abacus. This mechatronic system integrates mechanical engineering,

electrical engineering, and computer science, allowing us to develop skills in multiple fields of engineering. While the technical and STS topics are disparate, both assignments serve distinct purposes within the broader realm of science, technology, and society. The STS exploration delves into the complexities and trade-offs associated with energy storage technologies, while the technical project also yielded complexities and trade-offs within the design of the clock. Despite differing subject matters, both endeavors contribute to a comprehensive understanding of the sociotechnical landscape and highlight the importance of critical inquiry and skill development.