Thesis Project Portfolio

It Should Just Work – Thermo-Stasis

(Technical Report)

The Current Obstacles of Thermoelectric Semiconductor Technology from Efficiency, Performance, and the Environment

(STS Research Paper)

An Undergraduate Thesis

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Eric Choi

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Department of Electrical and Computer Engineering

Table of Contents

Sociotechnical Synthesis

Both my technical capstone project and my STS research project are related in regards to their involvement with Thermoelectric technology. Specifically, the Capstone project aimed to successfully implement this technology to create a battery-powered, stable, temperature-controlled environment that could perform both heating and cooling. This project was performed to address problems in regards to the viability and applications of thermoelectric technology with the specific application of food storage in mind for design parameters and constraints. The food storage parameters were assigned through a social/human aspect, the required temperatures to safely store food according to the FDA. Thermoelectric technology can be strongly tied to human and social aspects, like modern medical issues driving demand for improved refrigeration or new energy consumption legislation driving the need for more efficient technology alongside many more. The STS research project looks at these human and social aspects using a viewpoint of the Social Construct of Technology, such that the Thermoelectric technology as a whole is seeing development and improvements driven primarily by these human and social aspects. This theory can be applied by first reviewing documentation about how the technology works and its current limitations, weighing the influence of relevant legislation and programs that helped shape its development, and analyzing cases of development attempts that target issues and problems through the use of thermoelectric technology. In many cases, these studies can be compared to existing technologies that are more prevalent, like compressor systems that are more common for refrigeration or various forms of heat engines for generating electricity, in regards to electric efficiency, maintainability, and environmental sustainability. Using these comparisons, the current viability of thermoelectric technology can be evaluated while also attempting to predict the types of pushes that may need to happen to further develop thermoelectric technology based on the current social and human influences. My capstone project and STS research are very

strongly linked and thus can almost be directly related. Particularly, the capstone project is like a proof of concept for the current status of the technology and its viability for modern refrigeration applications. The STS research delves deeper into more future applications that are still being developed and need to be explored, like thermoelectric generation and experimental medical applications, as well as its societal influences. Together, they both show that, while thermoelectric technology is theoretically usable, it is extremely limited until the technology is further developed to be more efficient and is thus restricted to a few applications in which the benefits outweigh the costs. Further development may require some more societal pushes like additional legislation that seek greater efficiency or larger city-scale projects that seek to make use of waste energy.