Thesis Project Portfolio

Racing Battery Management System

(Technical Report)

Crude Capital: The Impact of Oil Money on European Football

(STS Research Paper)

An Undergraduate Thesis

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Table of Contents

Sociotechnical Synthesis

A Battery Management System (BMS) maintains the health of an electric vehicle's battery pack. It is essential to an electric vehicle's operation, because battery packs fuel the car. In battery packs without a BMS, a singular stray, dying battery can bring down the entire pack, and, consequently, ruin the car's operation. Since advancements in BMS technologies have continuously optimised electric vehicles, these vehicles become a feasible alternative to traditional ones, boosting their popularity. Advancements will continue, with research continuing at elite universities and laboratories. As a result, the automotive industry's demand for oil is expected to plummet, putting countries like Saudi Arabia and the United Arab Emirates in precarious positions. As a result, these countries have expanded their portfolios, investing in tourism and sports. In my theses, I focus on both the construction of a tailored BMS and the surge in Gulf-based investment in European football.

Specifically, my technical project pertains to the creation of a BMS for an electric race vehicle. Battery packs consist of lithium-based battery cells, often in series, with some form of casing and cooling system to preserve the units' health. A BMS complements these components and acts as a master controller. If there are disparities in a module, the BMS balances voltage and state of charge (SoC) via cell balancing, which is the use of switching transistors and diodes to balance out measurements in a module. In our project—done by John Link, Silas Schroer, Gabriel Binning, and I—we developed a BMS tailored for the intense heat and velocity conditions of competitive racing.

BMSs, amongst other technologies, have reduced the demand for oil. Historically, oil has been powerful. Both crude and refined oil have been the "most widely traded" commodities in the world and possess the most energy content of all the common fuel sources. In countries like

Kazakhstan, Angola, and Russia, oil has driven both opportunists and economies to prosperity. One notable example is Roman Abramovich, a Russian oligarch who purchased the oil giant Sibneft, which generates billions in annual revenue, for just $100 million. After a couple years, Abramovich sold his shares for billions and became one of Russia's richest men.

With his newfound wealth, Abramovich purchased English football club Chelsea in 2003, ushering in the sport's era of oil money. From 2003 to 2021, via extravagant spending, Abramovich spurred the club to two Champions League and five Premier League trophies. This move inspired other foreign investors, like Sheikh Mansour and Mohammed bin Salman, to purchase Manchester City (2008) and Newcastle United (2021) respectively. The trend is not limited to the England: Tamim bin Hamad Al Thani acquired French club Paris Saint-Germain (PSG) through Qatar Sports Investments in 2011. Given the rising influence of oil money, I seek to explore how it has shaped European football.

Ultimately, I wrote about oil money's influence on European football to understand its origins and effects. I was influenced by my technical project, because I believe that advancements in renewable energy have caused a ripple effect, somehow extending to European football. And they have. As a result, I made a strange connection between the topics and composed two seemingly unrelated papers. But, I'm thankful for that connection, and I hope my social paper lays the foundation for future analysis on how to mitigate oil money's adverse effects on football.