

Project ATLAS Hybrid Rocket Engine
(Technical Report)

The Struggle over the Future of Nuclear Energy
(Sociotechnical Research Paper)

An Undergraduate Thesis Portfolio
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by

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Preface

How can the energy efficiency of human activity safely be improved? Global energy demand is rapidly increasing, indicating a need for increased efficiency.

How can the safety of rocket motors be increased without sacrificing efficiency or increasing complexity? Many technologies that society depends on, including GPS, weather forecasting, and communications, are made possible by the ability to transport objects into space. Through this mechanical and aerospace engineering capstone project, the team designed and built a hybrid rocket motor for static testing. Hybrid propellant motors balance the benefits from solid and liquid motors without suffering from the same safety risks by having a solid fuel grain and liquid oxidizer. The team sought to maximize combustion efficiency by using methods enabled by new additive manufacturing of high-temperature resins. They performed three static hot-fire tests and did not achieve the desired combustion. Success would have validated novel testing methods and provided efficiency improvements.

How have energy companies, tech businesses, researchers, and environmentalists competed over the extent to which nuclear energy will be developed and used in Virginia? With the average age of operating nuclear reactors in the U.S. nearing half a century, the nuclear power issue may seem to be fading into irrelevance. Furthermore, it is excluded from the current “ideal” energy profile of the future by not being considered a renewable energy source. In the past decade, however, there has been a movement in Virginia toward investing more in nuclear energy. Advocates have reignited interest in nuclear energy by highlighting its potential to drive economic growth and reduce carbon emissions, while critics emphasize the high costs and environmental risks that make it an inadequate solution for both the environment and local communities.