

THESIS PROJECT PORTFOLIO

A Strive to Net-Zero: Insulation in Residential Housing

(Technical Report)

Escalation and Greenwashing: ExxonMobil's Trust Building Agenda

(STS Research Paper)

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A STRIVE TO NET-ZERO: INSULATION IN RESIDENTIAL HOUSING

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ESCALATION AND GREENWASHING: EXXONMOBIL’S TRUST BUILDING AGENDA

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PROSPECTUS

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Climate change is beginning to have drastic effects on everyday life, and the consequences are increasingly dire. Three important greenhouse gases (GHGs), methane, carbon dioxide, and nitrous oxide, set new year-to-date records for atmospheric concentrations in both 2020 and 2021. GHG emissions have caused the average global temperature to rise 1.5 °F since 1900, and this trend is projected to continue. As a result of this temperature rise, the frequency of dangerous extreme weather events, including hurricanes and flooding, is projected to increase. Other risks, such as disease caused by food, animals and water could pose fatal risks for humans if emissions are not reduced. Green energy innovations can be used to reduce or offset emissions in energy production, transportation, and industry. Moving towards a carbon-neutral world will undoubtedly require restructuring of business models and shifts in policy if the world is to successfully reverse the effects of climate change.

The technical research project examines how insulation affects heat loss in a net-zero carbon home. The three-dimensional model for testing the insulation materials was structured as a cube with a heat source inside, with one side on the cube modeled after a wall in a house. This side had the insulation to be tested inside a wooden frame, with drywall nailed to both sides to seal the frame. Heat transfer was measured across the insulation materials in order to quantify the experimental thermal conductivities of each material, which were compared with the values in literature. Our results demonstrated that interior convective currents negatively affected the performance of different materials. This was especially true when there were air gaps between the drywall and the insulation. Our results also showed that each insulation material behaved with the same experimental thermal conductivity at two different temperatures. Additionally, we were able to verify that the experimental R-values for each material were negligibly different.

experimental thermal conductivity and the highest experimental R-value, which aligned with what was expected. To maintain a larger temperature gradient across the wall of a house and minimize energy losses, the results support that convective currents need to be minimized inside the walls, and the insulation should be made thicker when possible.

The socio-technical research project assesses ExxonMobil's current business model through the documented frameworks on commitment escalation and greenwashing. Through analysis, the research paper examines the extent to which ExxonMobil is engaging in the aforementioned business strategies in order to build consumer trust, and the effectiveness and implications of those techniques. Through press releases and reports, there is evidence to suggest that ExxonMobil is engaging in escalation of commitment to carbon reduction. Escalation of commitment is defined as the tendency of a company to maintain support for a course of action, despite negative effects in some cases. In just eight years, ExxonMobil escalated from publicly acknowledging climate change to later committing to be a net-zero carbon company by 2050. These actions are consistent with business escalation techniques and help ExxonMobil to build consumer trust in the company. There is also some evidence to suggest ExxonMobil is engaging in greenwashing, which refers to a company engaging in false or misleading information about their stance towards the environments. Climate Solutions reports published by ExxonMobil indicate that they are reducing emissions by reducing methane intensity in their products. However, ExxonMobil maintains leadership positions in trade associations like the American Petroleum Institute, which actively work to advance the agendas of oil companies, mainly through lobbying. These attempts to build trust are not working well; only 68% of Americans claimed to trust oil companies in a recent study. However, ExxonMobil remains the top ranked

oil company in the U.S. and may continue to have negative impacts to climate change in the future if action is not taken.

The technical project resulted in interesting conclusions about insulation and heat loss, but not necessarily what was expected. The goal was to test out the effect on heat loss in the reCOVER house at UVA's Milton Airfield, and it was disappointing that the research was unable to move in that direction due to logistical and time constraints. Future researchers might be able to develop an automated controller for a heating system for use in a carbon-neutral house to minimize energy usage to heat the space. The socio-technical research project was very fruitful and turned-out better evidence than expected. There was good evidence to provide insight into the business strategies of ExxonMobil and what that might mean for the company. Future work could be done to analyze ExxonMobil's progress towards becoming a carbon-neutral company and propose how they will theoretically offset those emissions.