Thesis Title	**Development and Numerical Investigation of an Innovative Roof Vertical Wind Energy Harvester**
Programme of Studies	MSc in Energy Engineering
Course	MEE 540 MSc Thesis
Area of Study	Sustainable Energy Technologies – Wind Energy
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Short Description	The world is facing the challenge of climate change, and renewable energy has become a vital tool in mitigating this challenge. Rooftop solar panels and small wind turbines have been widely used as renewable energy sources, but their efficiency and durability are limited. A prototype Roof Vertical Wind Energy Harvester (RVWEH) is an innovative solution that can generate more power than equivalent solar solutions, and perform under extreme weather conditions. This master's thesis focused on the construction and testing of a prototype Roof Vertical Wind Energy Harvester (RVWEH) using 3D printing. The prototype was built with an aerodynamic design, which captured and amplified building airflow in wind speeds as low as 3 m/s. The design of the RVWEH was compared to traditional turbines in terms of energy output and maintenance requirements. In addition to the physical prototype, this thesis also involved numerical investigations of the RVWEH using Finite Element Method (FEM) analysis. The FEM analysis investigated the performance of RVWEH in different wind speeds, turbulence conditions, and wind directions. The numerical investigation also validated the experimental results obtained from the prototype. Furthermore, the thesis studied the potential of the RVWEH to integrate with existing solar solutions. The cost-effectiveness and space efficiency of the RVWEH were analyzed by comparing the energy output of a single RVWEH unit to solar panels. The result of this analysis revealed the potential of RVWEH to generate 100% of a building's onsite energy needs. The master's thesis aimed to contribute to the development of innovative renewable energy solutions that could mitigate climate change and create a path to energy independence. The RVWEH had the potential to revolutionize the rooftop renewable energy sector, and this thesis provided a comprehensive investigation of its performance and potential.