STATEMENT OF RESEARCH INTEREST

Energy is at the center of the world’s most significant challenges and opportunities for the 21st century. Communication technologies, education, industrialization, agricultural production and expansion of municipal water systems all require abundant, reliable and cost-effective energy access. As a result, there is an urgent need to envision and implement holistic energy policies that aim at the development of new energy technologies for improving end use energy efficiency, reducing Green House Gas (GHG) emissions and increasing the utilization of renewable energy sources.

According to the International Energy Agency (IEA), buildings currently account for 40% of primary energy consumption in most countries and are a significant source of carbon dioxide (CO2) emissions. The bulk of this energy is used to run HVAC systems. The challenge facing building services engineers worldwide is how to achieve high levels of indoor environmental quality while reducing energy consumption. By reducing overall building energy demand and improving energy efficiency, it is possible to significantly reduce CO2 emissions from the building sector. Increased utilization of renewable energies, improved building insulation and predictive control systems have been put forward as potential solutions for achieving these goals. I am interested in conducting PhD research on predictive HVAC control because it allows the taking of anticipatory action rather than corrective measures.

Studies have shown that predictive control strategies can significantly decrease energy consumption when considering both real time measurements and fore knowledge of upcoming weather conditions. There is a need to determine the amount of energy that can be saved through the use of predictive control. In the past, application to large scale building HVAC systems has been limited by the large number of controllable variables to be optimized but an increase in computational power in recent years has made it possible. This PhD Graduate student opportunity affords me the chance to actively and effectively contribute to the development of predictive control strategies that use weather forecasts to increase energy efficiency in building climate control while maintaining higher user comfort and limiting peak electricity demand.

I have a passion for energy related research and have carried out sustainable energy related research in both my undergraduate and graduate studies. In my final year I completed an independent research project on the ‘Design of a Solar Dryer for Paprika’. This project helped enhance my understanding of the technical, economic and social challenges faced in implementing solar and other renewable energy forms. I created a simulation program to take care of the transient nature of the driving forces, i.e. incident solar radiation, wind speed and ambient temperature, to ensure that the drying process was cost effective as well as time efficient. For my masters, I conducted a fulltime research project titled, ‘Investigation of Solar Powered Absorption Systems for South Africa’. I carried out two TRNSYS simulations of absorption air conditioning systems powered by solar energy and analysed their technical and economic effectiveness. Prior to doing my Masters I had worked as an airport mechanical engineer with the Civil Aviation Authority of Zimbabwe, and gained skills in maintenance and project management and was fully involved in CAPEX projects. During my masters studies I was a mentor for first year engineering students and offered them extra tutorials in Physics and Mathematics. I was also a teaching assistant in Heat Transfer, Alternative Energy Systems, Energy Management and Mechanical Engineering Design. I also underwent a four month internship during which I learnt HVAC system design, ducting and piping calculations, preparation of tender documents and all specifications required for the job preparation of project Bills of Quantities (BOQs), preparation of budget estimates and preparation of payment certificates. All these education and work experiences make me a perfect match for this particular PhD position.

I would like to study at Dalhousie University because it gives me the opportunity to be at the forefront of securing a sustainable energy future. There is a variety of internationally recognized researchers whose vast knowledge will benefit me immensely. Studying in Canada will also help me learn about and experience a different culture from my own and this will give me the understanding that I need to in contribute positively to the world economy.