Notice of the Final Oral Examination
for the Degree of Master of Applied Science

of

OLIVER PIRQUET

Bng (University of Victoria, 2012)

“Aero-elastic Energy Harvesting Device: Design and Analysis”

Department of Mechanical Engineering

Tuesday, September 8, 2015
3:00 P.M.
Engineering and Computer Science Building
Room 660

Supervisory Committee:
Dr. Ben Nadler, Department of Mechanical Engineering, University of Victoria (Co-Supervisor)
Dr. Curran Crawford, Department of Mechanical Engineering, UVic (CO-Supervisor)

External Examiner:
Dr. Alex van Netten, Department of Physics and Astronomy, UVic

Chair of Oral Examination:
Dr. Michel Lefebvre, Department of Physics and Astronomy, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

An energy harvesting device driven by aeroelastic vibration with self-sustained pitching and heaving using an induction based power take off mechanism has been designed and tested for performance under various operating conditions. From the data collected the results show that the device achieved a maximum power output of 8.3 mW and a maximum efficiency of 2.26% at a reduced frequency of 0.143. For all airfoils tested the device was shown to be self-starting above 3 m/s. A qualitative description relating to the performance of the device considering dynamic stall and the flow conditions at optimal reduced frequency has been proposed and related to previous work. Performance was observed for angles off the wind up to 22 degrees and was observed to have no reduction in power output due to the change in angle to the wind. The device has shown evidence of having a self-governing capability, tending to decrease its power output for heavy wind speeds, a thorough examination of this capability is recommended for future work.