University of Victoria | Graduate Studies

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

of

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"Demand-Side Participation & Baseline Load Analysis in Electricity Markets"

Department of Mechanical Engineering

Friday, December 2, 2016
3:00 P.M.
Engineering Office Wing
Room 106

Supervisory Committee:
Dr. Curran Crawford, Department of Mechanical Engineering, University of Victoria (Supervisor)
Dr. Yang Shi, Department of Mechanical Engineering, UVic (Member)

External Examiner:
Dr. Lin Cai, Department of Electrical and Computer Engineering, UVic

Chair of Oral Examination:
Dr. Randy Scharien, Department of Geography, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

Demand participation is a basic ingredient of the next generation of power exchanges in electricity markets. A key challenge in implementing demand response stems from establishing reliable market frameworks so that purchasers can estimate the demand correctly, buy as economically as possible and have the means of hedging the risk of lack of supply. System operators also need ways of estimating responsive load behaviour to reliably operate the grid. In this context, two aspects of demand response are addressed in this study: scheduling and baseline estimation. The thesis presents a market clearing algorithm including demand side reserves in a two-stage stochastic optimization framework to account for wind power production uncertainty. The results confirm that enabling the load to provide reserve can potentially benefit consumers by reducing electricity price, while facilitating a higher share of renewable energy sources in the power system. Two novel methods, Bayesian Linear regression and Kernel adaptive filtering, are proposed for baseline load forecasting in the second part of the study. The former method provides an integrated solution for prediction with full accounting for uncertainty while the latter provides an online sequential learning algorithm that is useful for short term forecasting.