**Wind Flow Analysis on a Complex Terrain**

**ABSTRACT**

 The main aim of this thesis is to compare actual power production from an existing wind farm with power production predicted by WindSim, which is a CFD tool based on a nonlinear flow model. The wind farm in analysis is located in Northern Sweden and has high orographic complexity with forested hilly terrain. There is 1 year record of met-mast wind measurements and nearly 2 years record of production data. Firstly, roughness and height data are given as input in order to simulate and generate the wind fields over the complex terrain. In addition, the forest model is used to get more detailed roughness height. After generating the wind fields, the existing turbine locations and 1 -year wind speed measurements are imported. The results show how accurate the CFD calculations are to solve turbulence in complex terrain. Comparison between actual production data and simulated energy production values is the main approach of this thesis work to validate the simulations. The results indicate that both WAsP and WindSim overestimate the energy production and the wind speed. However, particularly when using the WindSim forest module, the CFD calculations have more accurate results than the WAsP estimations.