Risk and investment management in liberalized electricity markets

Electricity markets around the world are currently undergoing a liberalization process that changes the way electricity is traded and priced as a commodity. The electricity system has unique technical characteristics and the importance of electricity as a good in today's informational society is significant. Liberalization does not change the fact that politicians and regulators will be held responsible for keeping the lights on at reasonable costs. What changes is the tool used by regulators to accomplish this task. The introduction of competitive markets implies that market participants will be held financial responsible for their decisions. Regulated system operators remain responsibility for the physical balancing and electricity markets will therefore remain strongly regulated even after liberalization. The combination of strongly regulated but competitive trading arrangements creates an environment where market participants will face a new set of financial risks comprising elements of competition, physical electricity characteristics and potential political regulatory intervention. On the other side of the market regulators and politicians will face the complex task of designing an electricity market that can outperform the previously regulated monopolies with respect to the three main requirements of security of supply, economical efficiency and environmental protection. The economic theory of electricity markets forms an essential basis for decision making in a liberalized setting. The effect of financial risk on decision making is becoming an increasingly important topic within this field of electricity economics, due to the significant elements of uncertainty in electricity markets.

A primary goal of the thesis is to increase the understanding of how the introduction of competitive markets affects the nancial risk related to different decision problems within the areas of risk management and investments in liberalized electricity markets. Focus is on applied microeconomics and analyzes of the interplay between market design parameters and the technical characteristics of the electricity system. Theory, literature and introduction to speci c problem areas related to risk management and investments is provided in two separate introductory chapters. Contributions to research within specific problems areas is then subsequently provided by five research papers. The two topics are relatively broad, however the two chapters and ve papers all share analyzes of nancial risk in liberalized electricity markets as a common underlying theme. The risk management part of the thesis focusses on modelling and measurement of financial risk in electricity markets. Key topics are electricity price modelling and the development of risk measures suitable for electricity market portfolios. Risk management tools used for nancial assets have until recently largely been transferred more or less directly to electricity market portfolios which include physical assets such as power plants and retail contracts. The hypothesis of this thesis is that the relevance of nancial tools for electricity market risk management, depends critically on the technical characteristics of electricity assets and on the demands placed by the stakeholders in the electricity sector. In many cases such technical characteristics and stakeholder demands will imply a need for revised and renewed tools compared to those used for portfolios of nancial assets. Chapter 2 in the thesis discuss such developments and provides a literature review of risk management modelling theory and applications in electricity markets.