

Hydro resource management, risk aversion and equilibrium in an incomplete electricity market setting

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Abstract— Since the outset of power system reform, one of the main objectives of regulation has been to assess whether the market, of its own accord, can induce agents to adopt decisions that maximise social welfare.

This paper analyses the effect of generating companies' risk aversion on their medium-term (typically 1 year) hydroelectric resource planning, along with its possible inducement of system operation that deviates from the centralised (maximum social welfare) solution.

Forward markets may play a key role by making hedging instruments available to risk-averse agents. A stylised mathematical model is used in this study to prove the equivalence of centralised planning and market equilibrium in the presence of such agents under the following assumptions: 1) both the spot and forward markets are perfectly competitive; 2) it has at least one risk-neutral consumer or arbitrageur; 3) all agents share the same beliefs about uncertain parameters; 4) only one price is in place in each trading period (which can be perfectly hedged with a forward contract); and 5) a solution for the resulting market equilibrium problem exists.

The findings show that such equivalence vanishes when forward markets are missing or inaccessible (attributable in some electricity markets to the absence of demand-side participation). This article consequently suggests that requiring demand-side agents to sign forward contracts with generators might constitute an effective regulatory measure where no fully functional forward market is already in place.

Index Terms— Medium-term planning; Electricity markets; Regulatory intervention

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