Using Storage-Capacity Rights to Overcome the Cost-Recovery Hurdle for Energy Storage

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Overview

Energy storage is a unique technology in that it can provide multiple services. This unique feature also raises cost-recovery issues for energy storage, due to the combination of competitive markets and ratebased cost-recovery used in many jurisdictions today. This hybrid regulatory paradigm relies on classifying assets as providing competitively prices or unpriced services and handling cost recovery based on that classification. Some recent regulatory precedents suggest that energy storage developers must choose between classifying their assets as providing competitively priced or unpriced services. In the former case, energy-storage costs must be recovered through the market. If an asset is classified as providing only unpriced services, costs can be recovered through the ratebase.

This regulatory design can hamper cost-recovery for energy storage and may lead to inefficient energy-storage investment and use.

Methods

We propose an alternate solution whereby physical storage-capacity rights are auctioned to third parties. The third parties use their rights for priced or unpriced services. Storage-capacity rights disentangle cost recovery of energy storage from the regulatory treatment of its end use. We formulate the auction model for the storage-capacity rights as a linear optimization model.

Results

Using duality theory and Karush-Kuhn-Tucker conditions we are able to derive a pricing rule for the storage-capacity rights that have two important properties. First, the pricing rule is equilibrium-supporting, in the sense that the holders of storage-capacity rights have no profitable deviation from the rights they are allocated by the auctioneer. Second, the pricing rule guarantees that the auctioneer earns non-negative profits from allocating the rights and that the total revenues earned by the auctioneer exactly equals the imputed marginal value of energy-storage capacity. This means that the allocation mechanism provides "correct" incentives for investment in energy-storage capacity.

Conclusions

We demonstrate that storage-capacity rights are an effective solution to the cost-recovery problem facing energy storage.

References

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