Abstract

We consider the problem of allocating a capital budget to solar panels and storage to maximizw the expected revenue in the context of a large-scale solar farm participating in an energy market. This problem is complex due to many factors. To begin with, solar energy production is stochastic, thus the access link is typically provisioned at less than peak capacity, leading to the potential waste of energy due to curtailment. The of storage reduces the amount f energy produced. Moreover, energy storage devices are imperfect. A solar farm owner is thus faced with two problems:

1. deciding the level of power commitment

2. the operation of storage to meet this commitment. We formulate two problems corresponding to two different power commitment approaches, an optimal one and a practical one, and show that the two problems are convex, allowing efficient solution. Numerical examples show that our practical power commitment approach is close to optimal and also provide several other engineering insights.

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