

Taming the Duck: Can Stochastic Programming Help?

October 20, 2018

1. Quandary
2. Modeling methodology
3. Experimental Outcomes

The presented outcomes are based on observations made at every 15 minutes.

3.1. Reliability Impact

Unmet Demand In Figure 1, we demonstrate the average and maximum unmet demands amounts. These amounts tend to grow with increased solar and wind integration, however, seems to be mitigated with higher reserve considerations and stochastic operations planning strategies.

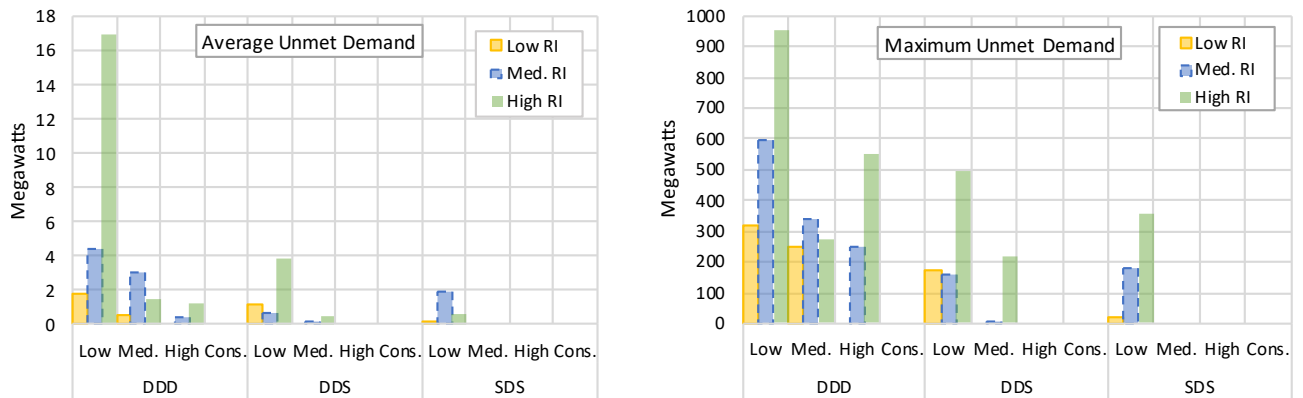


Figure 1: Average and maximum unmet demand amounts under different reserve requirements and operations planning strategies.

Reliance on ST-UC

Over Generation and Renewable Curtailment

3.2. Economic Impact

Figure 3 demonstrates the average daily operating-costs recorded in our experiments¹. In line with our expectations, increased renewable integration leads to lower costs whereas increased reserve requirements have the opposite effect. We focus on a few examples where the network demand is seamlessly fulfilled. With the DDD planning strategy, the minimum cost of operating a reliable network is approximately \$13.0 million under low renewable integration (with high reserve requirements), and \$

While reading this figure, it is important to focus on the experimental settings where the unmet demand levels are negligible.

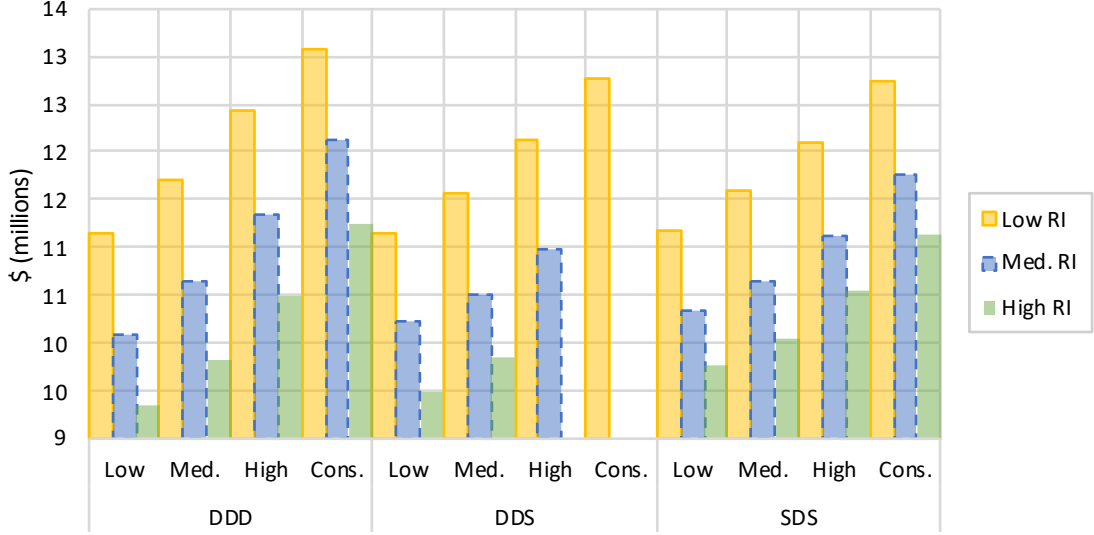


Figure 2: Average daily operating cost of the power system under different reserve requirements and operations planning strategies.

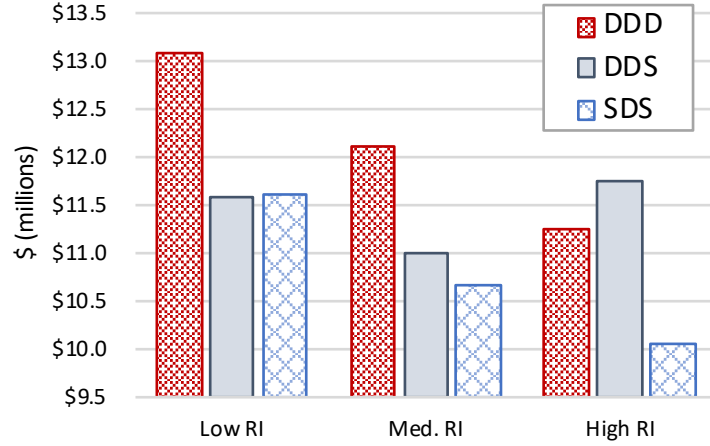


Figure 3: Average daily operating cost of the power system under all operations planning strategies (only the minimum reserve requirements leading to zero unmet demand are considered).

¹This figure neglects the cost of fulfilling the unmet demands reported in the earlier sections.

3.3. Environmental Impact

Counts of words

File: writeup.tex

Encoding: utf8

Sum count: 253

Words in text: 152

Words in headers: 31

Words outside text (captions, etc.): 70

Number of headers: 11

Number of floats/tables/figures: 3

Number of math inlines: 0

Number of math displayed: 0

Subcounts:

text+headers+captions (#headers/#floats/#inlines/#displayed)

15+7+0 (1/0/0/0) _top_

0+1+0 (1/0/0/0) Section: Quandary

0+2+0 (1/0/0/0) Section: Modeling methodology

12+2+0 (1/0/0/0) Section: Experimental Outcomes

36+12+14 (4/1/0/0) Subsection: Reliability Impact

89+2+56 (1/2/0/0) Subsection: Economic Impact} Figure \ref{sec:experiments:fig:avg_daily_cos

0+5+0 (2/0/0/0) Subsection: Environmental Impact

Included file: ./preamble.tex

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Files: 2