Taming the Duck: Can Stochastic Programming Help?

October 27, 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.

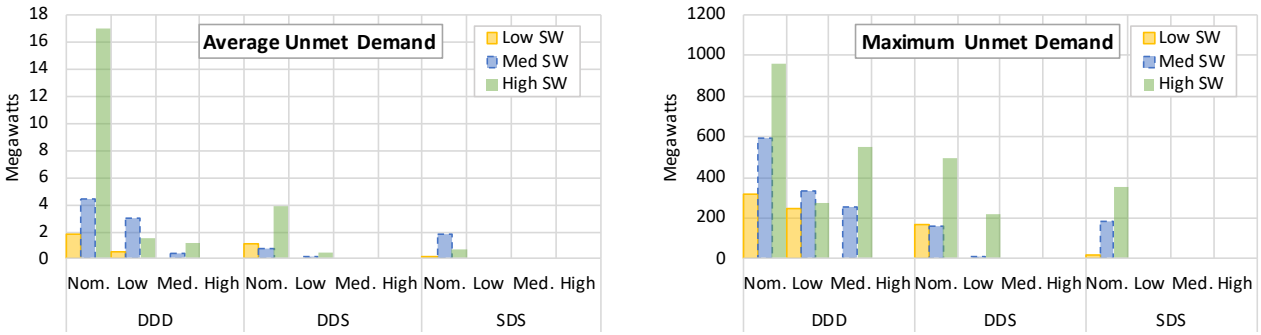

Figure 1: Average and maximum unmet demand amounts under different reserve requirements and operations planning strategies.

Reliance on ST-UC

Over Generation and Renewable Curtailment

3.2. Economic Impact

Figure 2 demonstrates the average daily operating-costs recorded in our experiments[1]. In line with our expectations, increased renewable integration leads to lower costs whereas increased reserve requirements have the opposite effect.

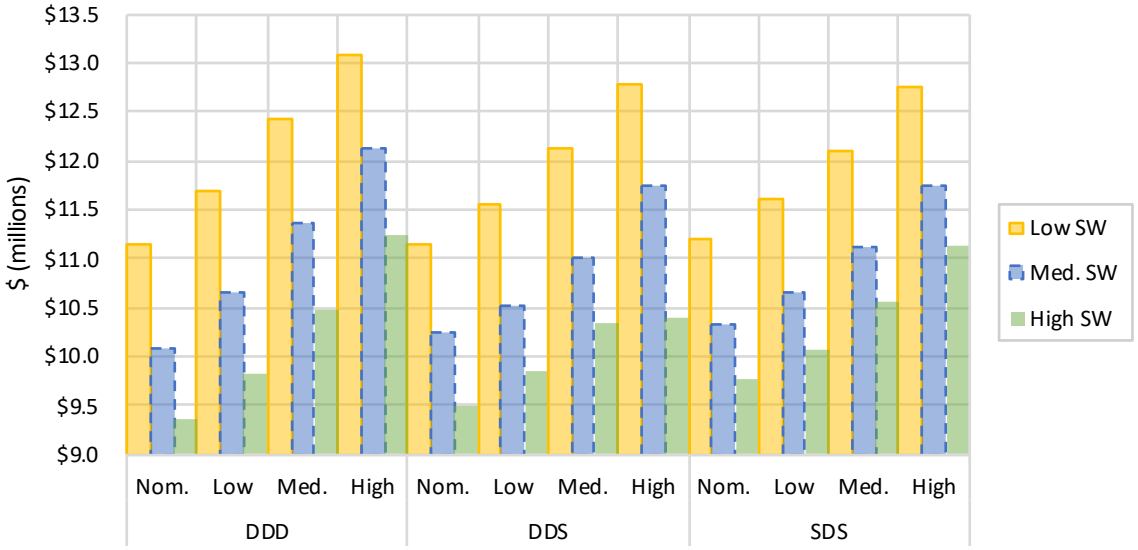

Figure 2: Average daily operating cost of the power system under different reserve requirements and operations planning strategies.

Next, we focus on cases examples where the network demand is seamlessly fulfilled. In particular, in Figure 3, we demonstrate the operating costs for the minimum reserve-requirement levels, subject to zero unmet demand.

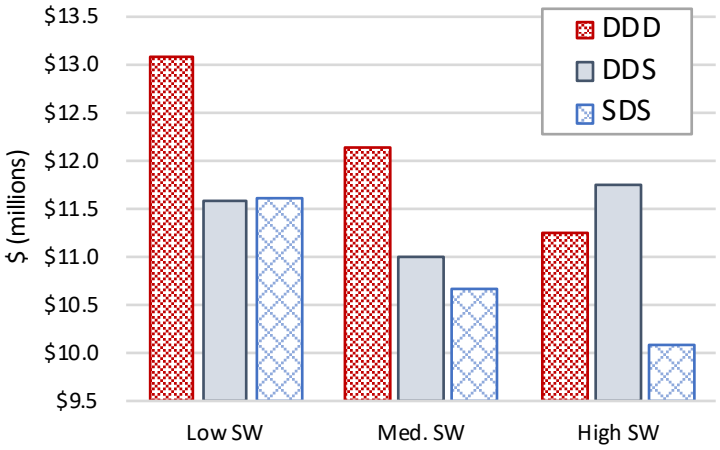

Figure 3: Average daily operating cost of the power system under all operations planning strategies (only the minimum reserve requirements leading to zero unmet demand are considered).

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

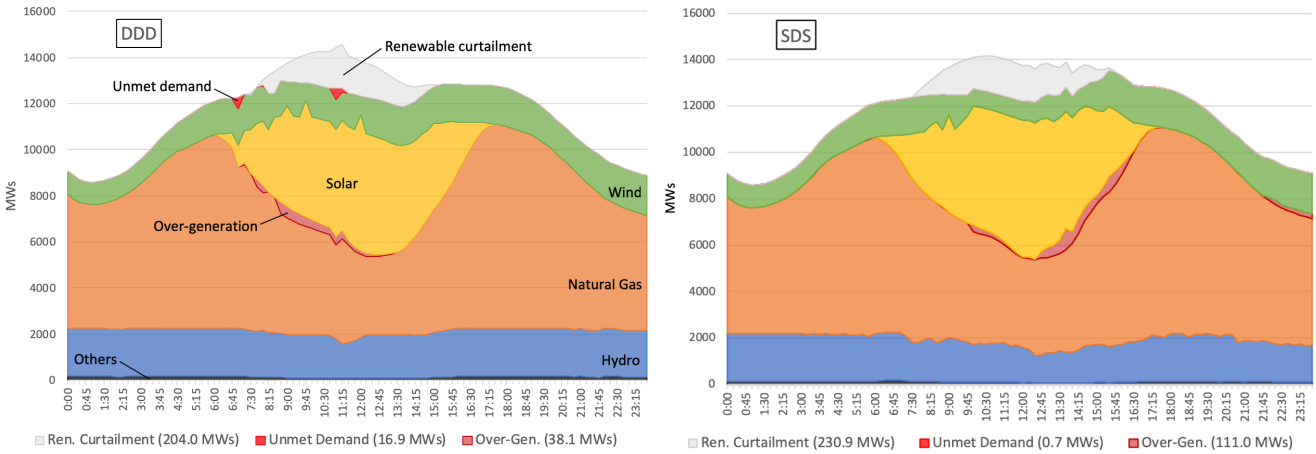

Figure 4: Caption pending

3.3. Environmental Impact

Counts of words

```
File: writeup.tex
Encoding: utf8
Sum count: 228
Words in text: 125
Words in headers: 31
Words outside text (captions, etc.): 72
Number of headers: 11
Number of floats/tables/figures: 4
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
  62+2+58 (1/3/0/0) 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
Encoding: utf8
Sum count: 0
Words in text: 0
Words in headers: 0
Words outside text (captions, etc.): 0
Number of headers: 0
Number of floats/tables/figures: 0
Number of math inlines: 0
Number of math displayed: 0

File(s) total: writeup.tex
Sum count: 228
Words in text: 125
Words in headers: 31
Words outside text (captions, etc.): 72
Number of headers: 11
Number of floats/tables/figures: 4
Number of math inlines: 0
Number of math displayed: 0
```

```
Files: 2
```