PPG Block with Shaping Analysis

June 18, 2024

Summary

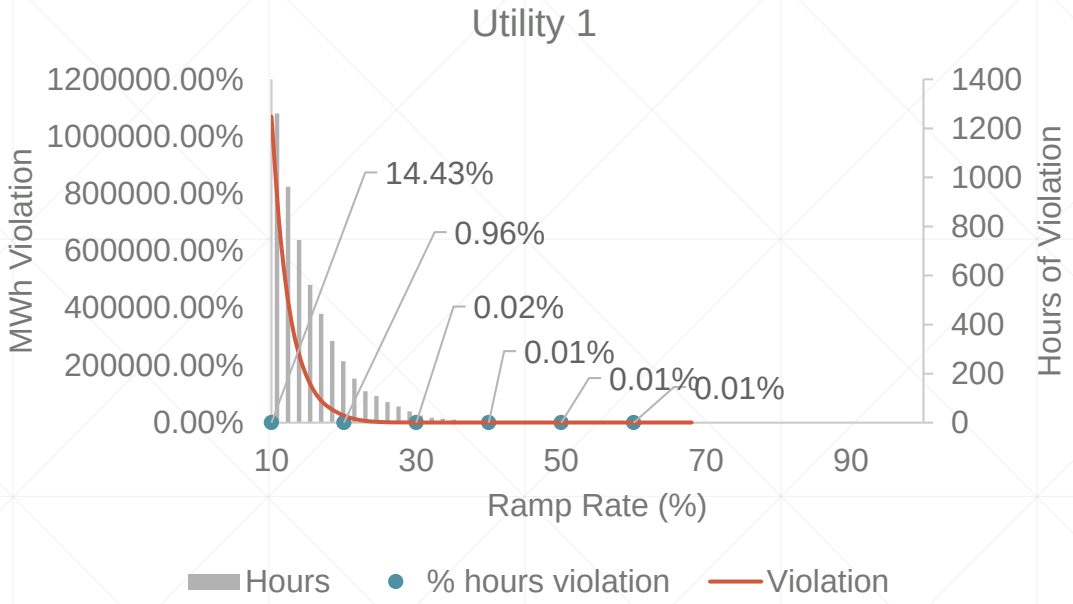
- Analysis 1: Simple Evaluation of Ramp Rate Needed to Meet Peak Load
- Analysis 2: Evaluation Ramp Rates Needed Given Usage Constraints
- PLVS Capacity Contribution

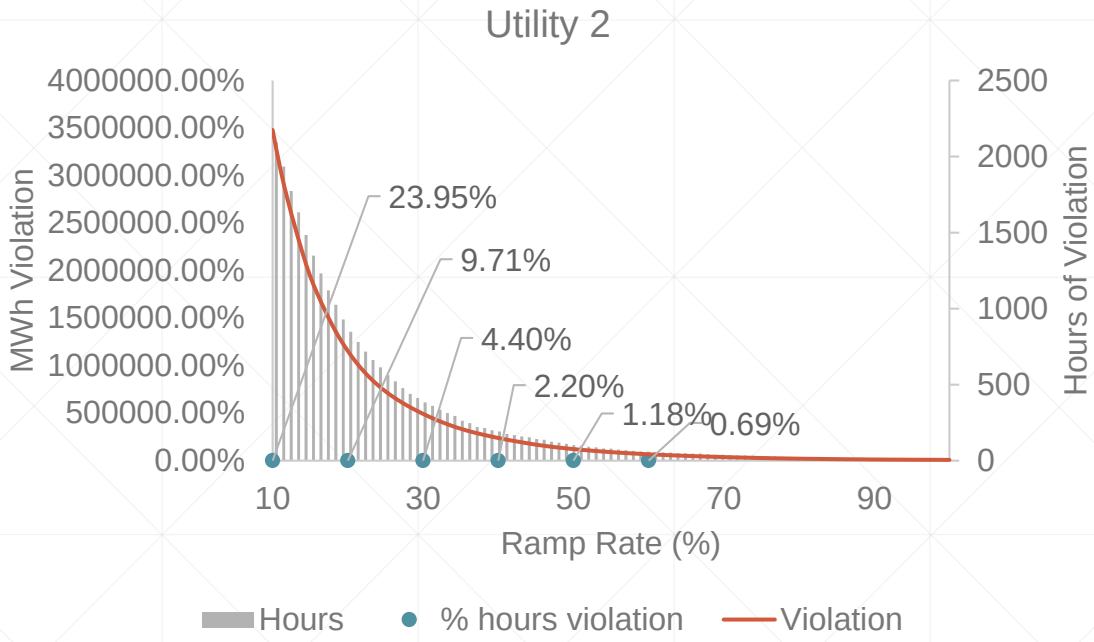
Analysis 1: Simple Evaluation of Ramp Rate to Meet Peak Load

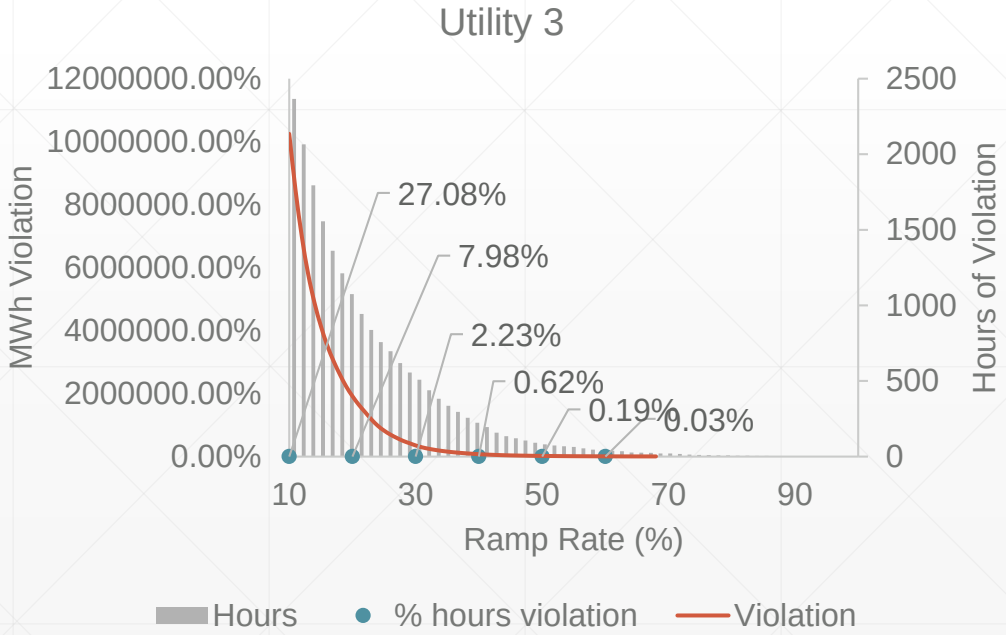
- The goal of this analysis is to evaluate at a high-level, **what ramp rate is needed to meet peak loads for each utility**
- To evaluate this, each hour, a block schedule is created with the objective function being minimize the difference between the block schedule and requirements load (defined as FY 2023 metered load minus dedicated non-federal resource generation)
- All product constraints are ignored other than ramp rate, so there is no consideration for monthly usage, min/max, etc.
- Note: while this is not how the product would be used in real life, this is meant to serve as a proxy for evaluating what a sufficient ramp rate would be across a variety of utilities

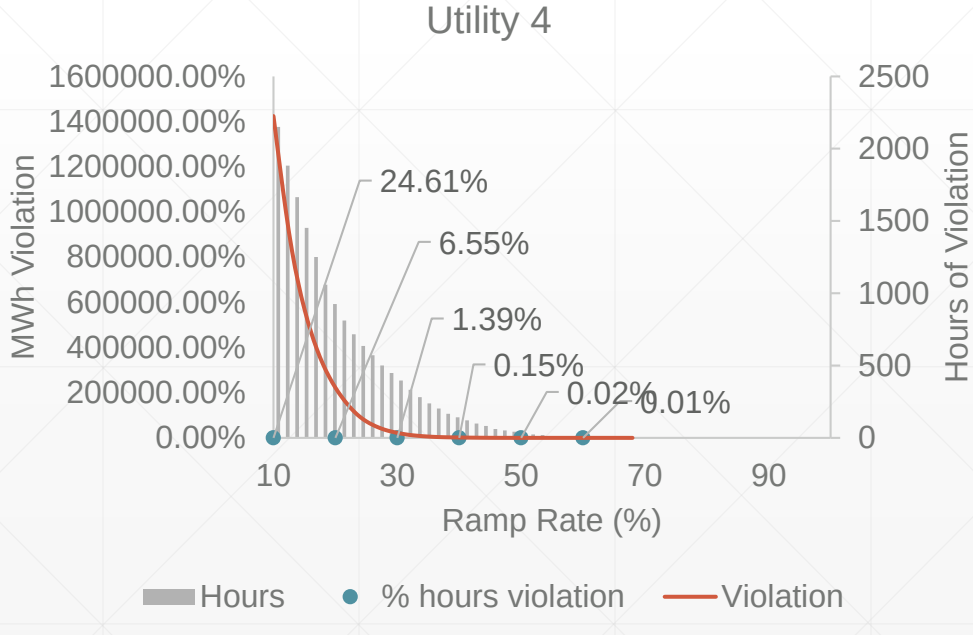
Analysis 1: Assumptions

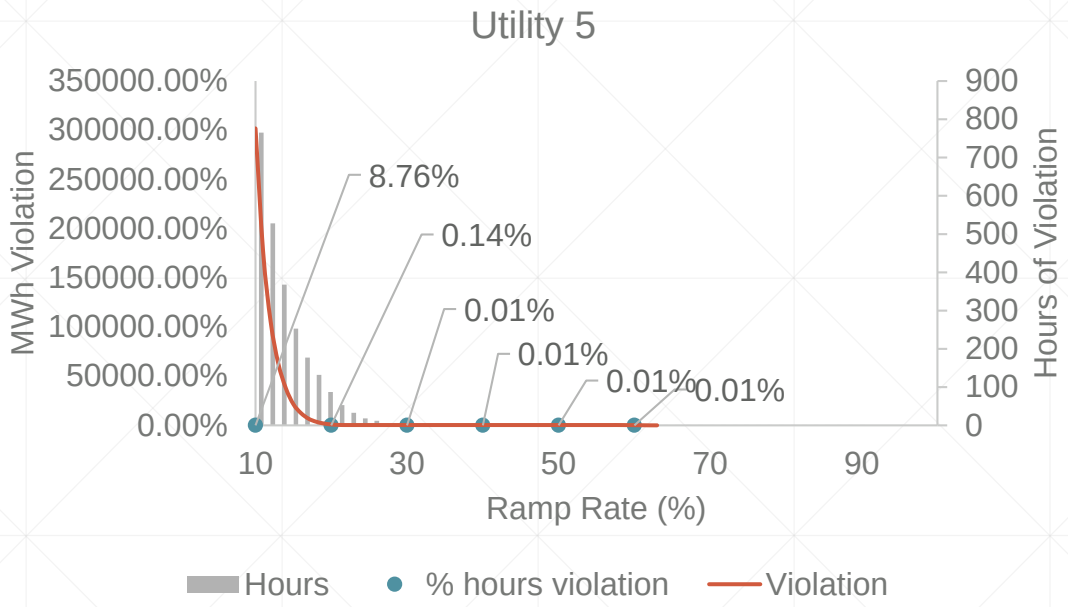
- Assumptions are generally based off what BPA has proposed in writing
- All schedules are based on the PNR calculation, not the XX% Block
- Assumed that PNR subtracts out NLSL

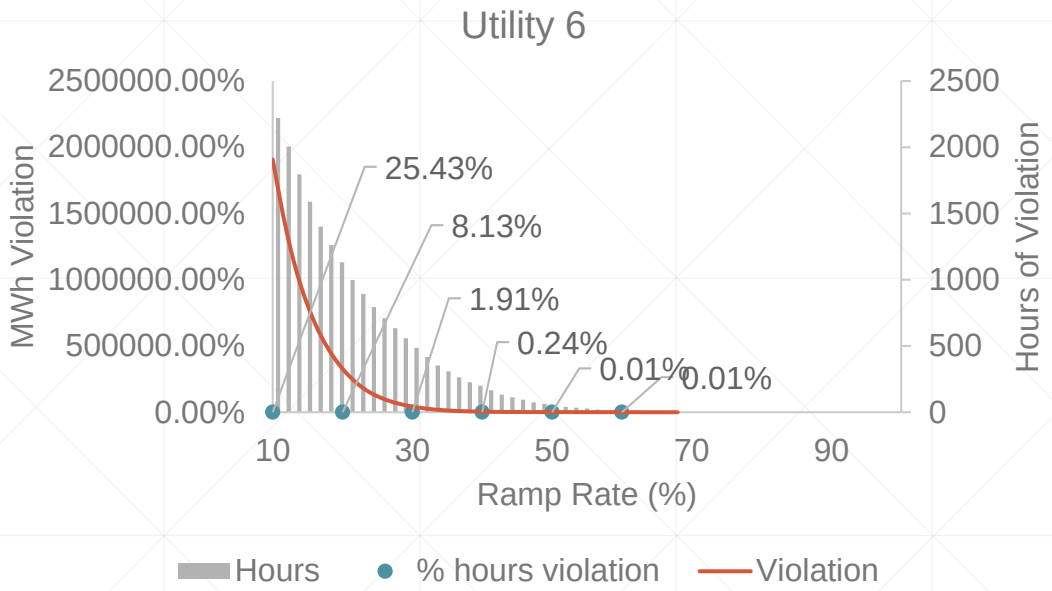

Utility 1
MWh Violation
Hours of Violation
Ramp Rate (%)
14.43%
0.96%
0.02%
0.01%
0.01%
0.01%
Hours
% hours violation
Violation

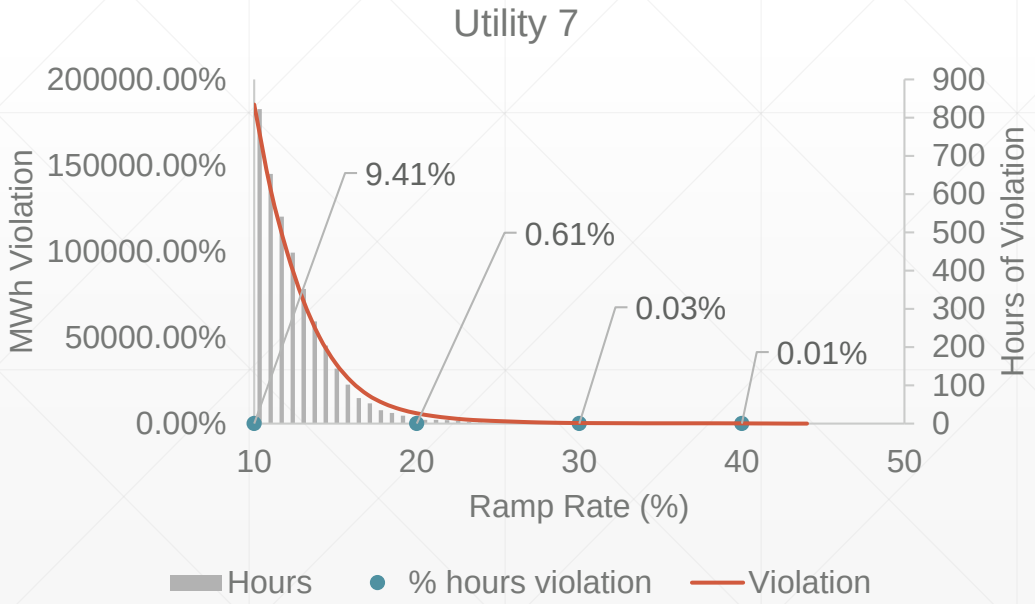

Utility 2
MWh Violation
Hours of Violation
Ramp Rate (%)
23.95%
9.71%
4.40%
2.20%
1.18%
0.69%
Hours
% hours violation
Violation

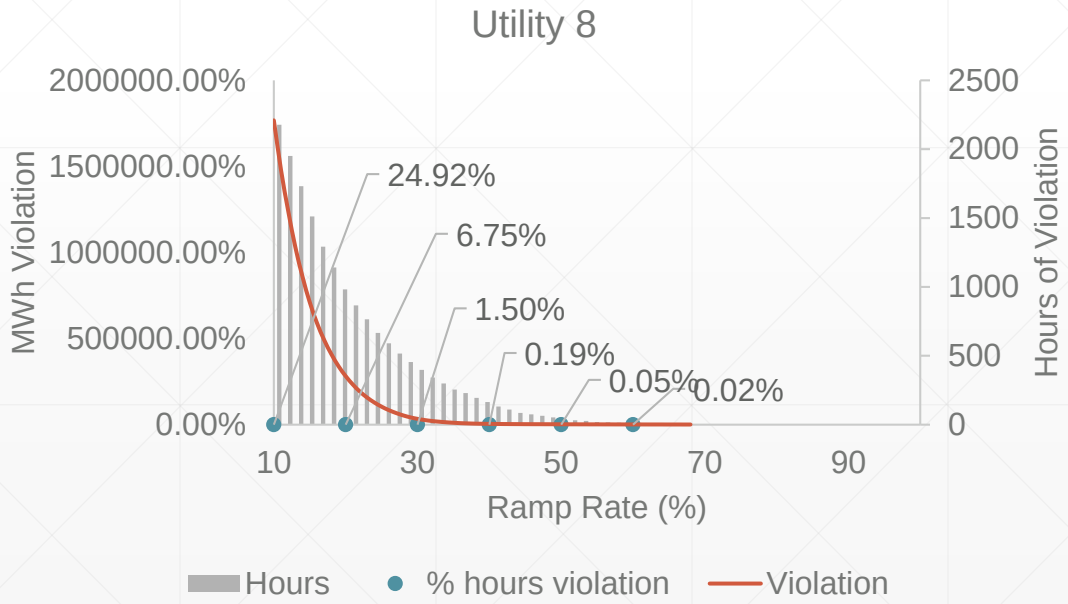

Utility 3
MWh Violation
Hours of Violation
Ramp Rate (%)
27.08%
7.98%
2.23%
0.62%
0.19%
0.03%
Hours
% hours violation
Violation


Utility 4
MWh Violation
Hours of Violation
Ramp Rate (%)
24.61%
6.55%
1.39%
0.15%
0.02%
0.01%
Hours
% hours violation
Violation


Utility 5
MWh Violation
Hours of Violation
Ramp Rate (%)
8.76%
0.14%
0.01%
0.01%
0.01%
0.01%
Hours
% hours violation
Violation


Utility 6
MWh Violation
Hours of Violation
Ramp Rate (%)
25.43%
8.13%
1.91%
0.24%
0.01%
0.01%
Hours
% hours violation
Violation


Utility 7
MWh Violation
Hours of Violation
Ramp Rate (%)
9.41%
0.61%
0.03%
0.01%
Hours
% hours violation
Violation


Utility 8
MWh Violation
Hours of Violation
Ramp Rate (%)
24.92%
6.75%
1.50%
0.19%
0.05%
0.02%
Hours
% hours violation
Violation

Key Takeaways

- It is generally expected that utilities with peakier loads would have more difficulty ramping up than those with relatively flat loads
- However, given that the block shaping capacity (and ramp rates) are determined by the difference between average load and peak load, there is not a clear association between load peakiness and ability to meet peak load
- 30% appears to be the point at which there is diminishing benefits for increasing ramp rate for most utilities

Analysis 2: Evaluation Ramp Rates Needed Given Usage Constraints

Analysis 2: Evaluation of Ramp Rates Needed Given Usage Constraints

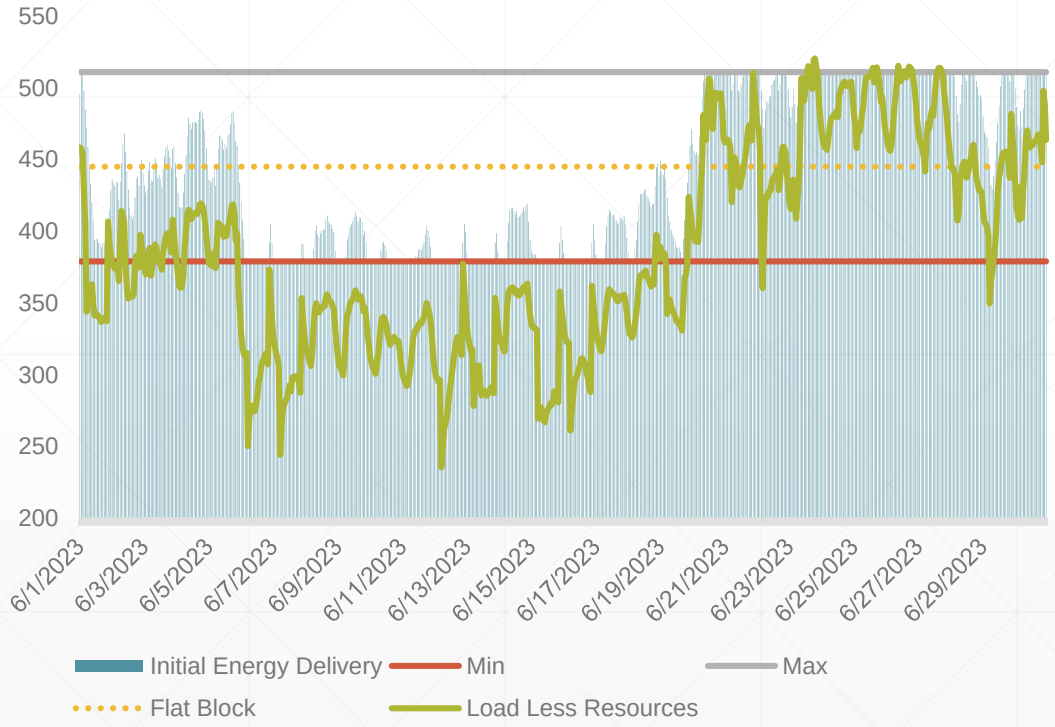
- The goal of this analysis is to evaluate **what ramp rate is needed to meet peak loads** for each utility **given feasible use of the product**
- 26 hypothetical FY23 block schedules at 26 ramp rates are calculated for each hour with the objective function of meeting requirements offer obligation
  - The requirements offer obligation is represented by load minus non-federal resources minus AHWM load
  - To calculate the initial block schedule, requirements offer obligation is scaled to the monthly tier 1 block amount—the intent of normalization is to meet the monthly usage constraint
  - In the initial block schedule, block = normalized offer obligation UNLESS this results violating a constraint: exceeding the max or the ramp rate, or falling short of the min
  - After the initial schedule is calculated, a final schedule is recalculated to meet the 14 day 45%/55% usage constraint
  - Caveat: the final schedule does result in a very small number of ramp rate and usage violations (<.5% of block) given it is not allowed to exceed min/max and that it is adjusted to meet usage targets

Assumptions

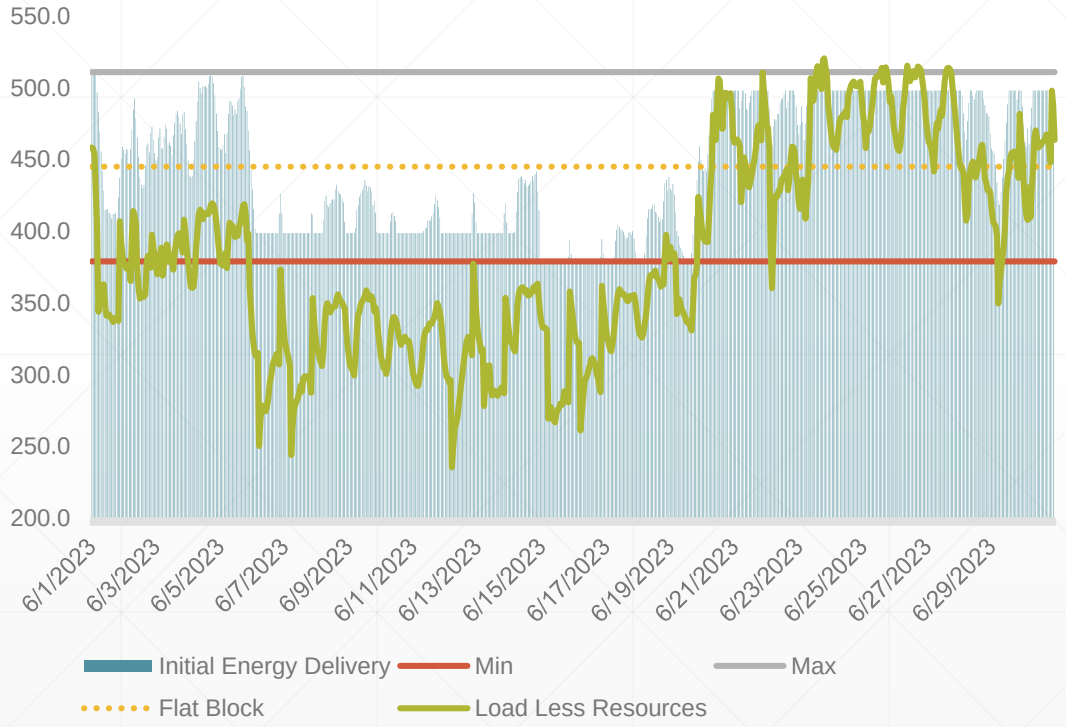
- Assumptions are generally based off what BPA has proposed in writing
- Monthly block shape is based on 5 years of data per BPA proposal
- **All schedules are based on the PNR calculation, not the XX% Block**
- The Min block % is the lesser of flat block amount minus shaping capacity and 60% of Block
- Assumed that PNR subtracts out NLSL
- Assumed PNR subtracts out WRAP QCC of dedicated resources, and capacity contribution is estimated for non-WRAP months
- Used either FY 2023 or 2024 Net Requirements Data
  - RHWM, TRL Forecast, TRL Peak, Resources, NLSL, etc.

Example of Hourly Schedule @ 20% Ramp Rate

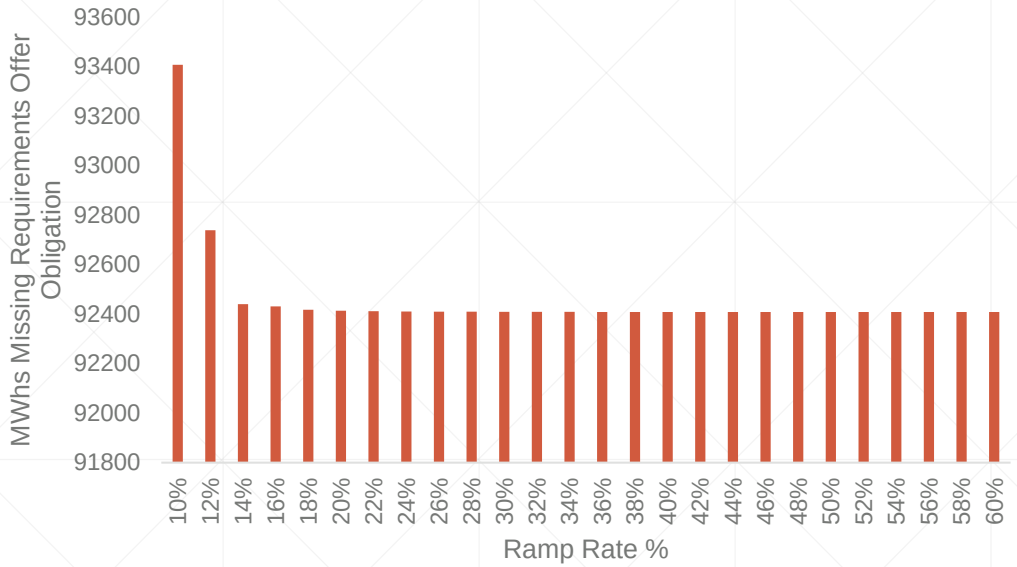
Initial Schedule – **No 14 Day Usage Constraint**



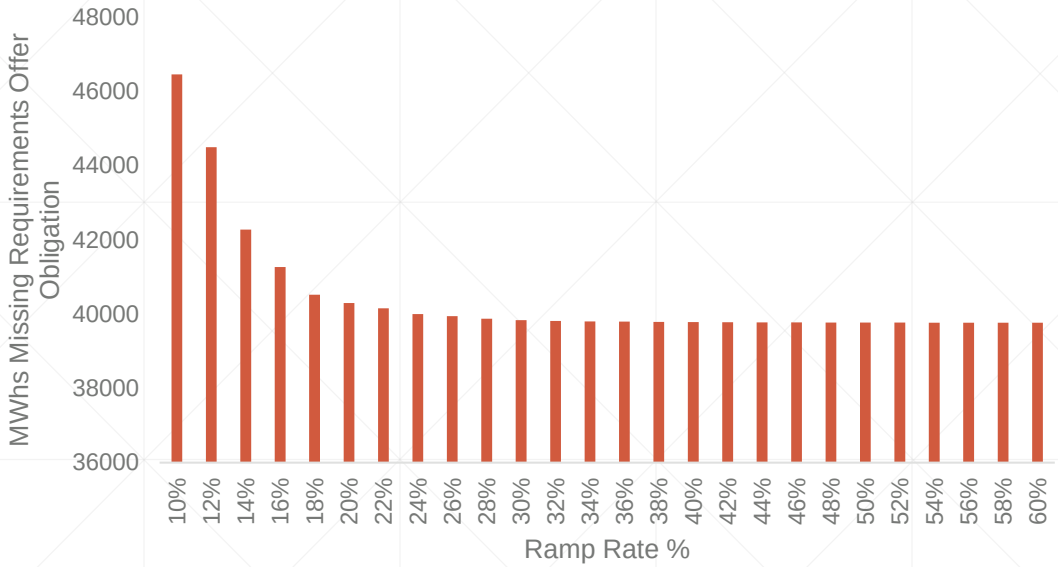
Final Schedule – **w/ 14 Day Usage Constraint**



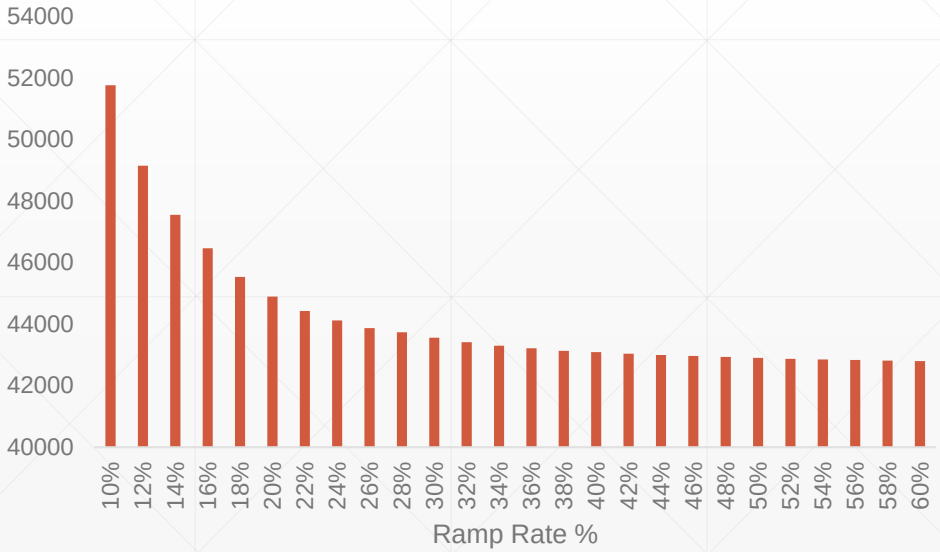
Utility 4 – w/ Usage Constraints



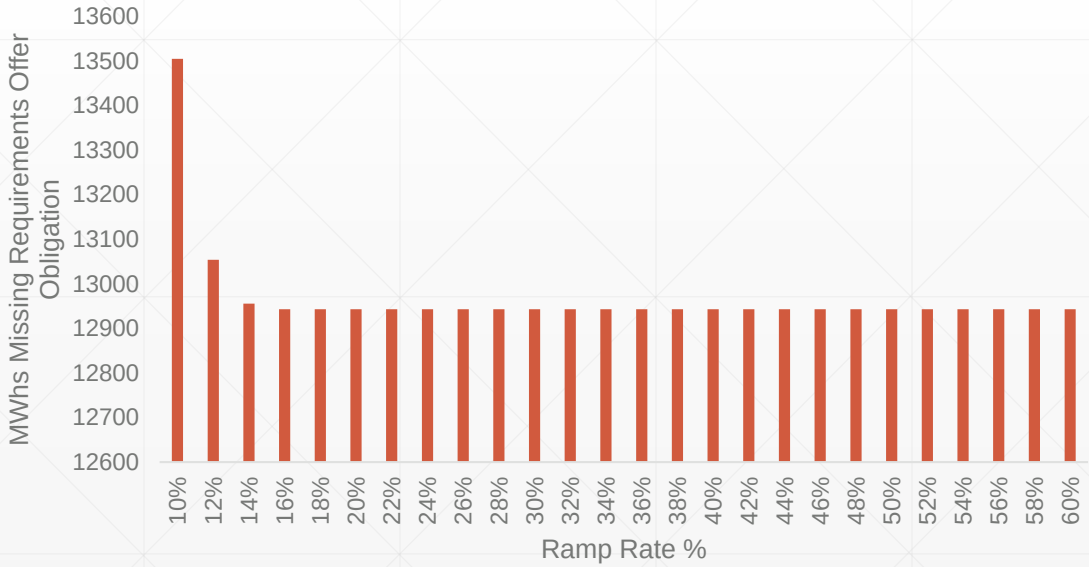
Utility 8 - w/ Usage Constriants

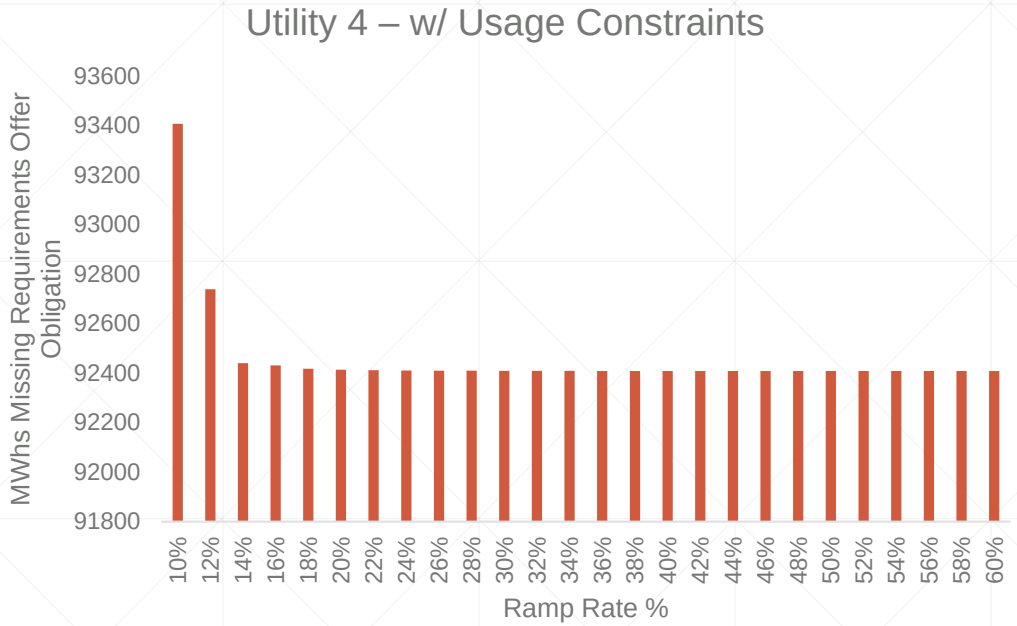


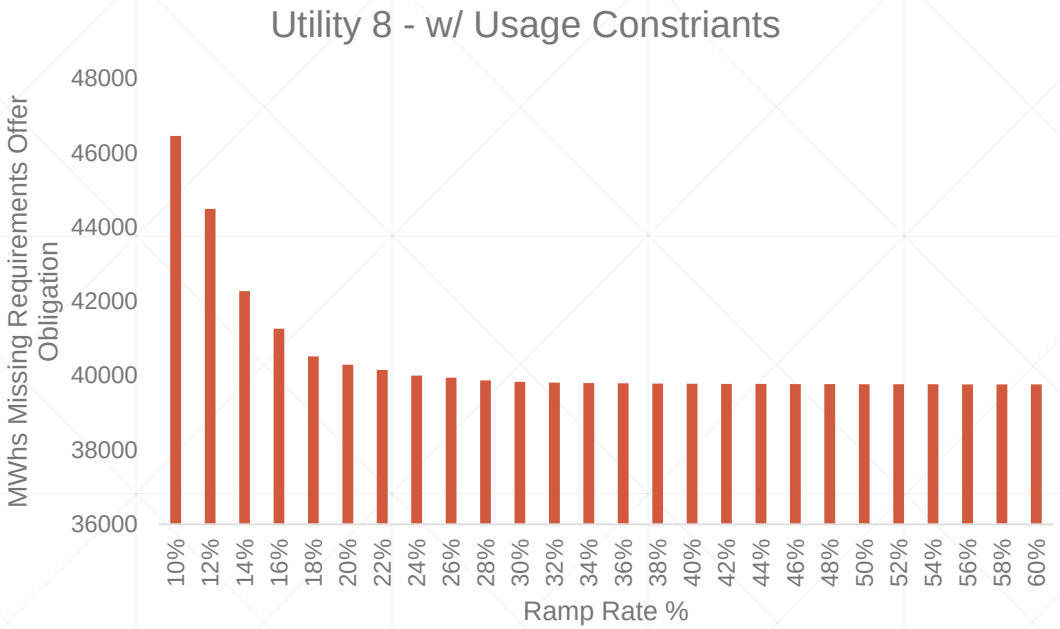
Utility 2 – w/ Usage Constraints

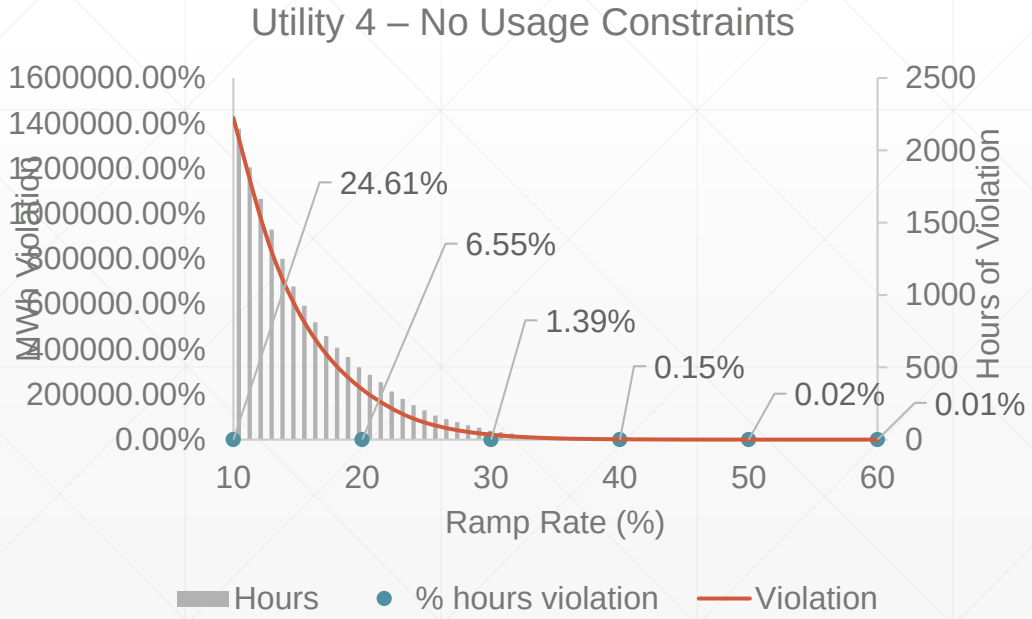


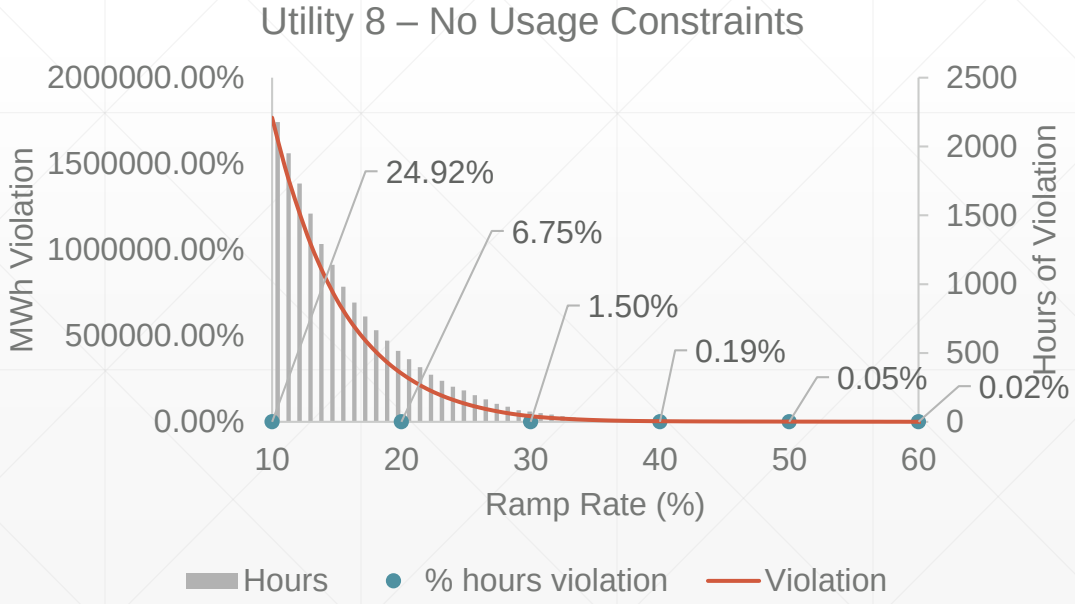
Utility 5 – w/ Usage Constraints



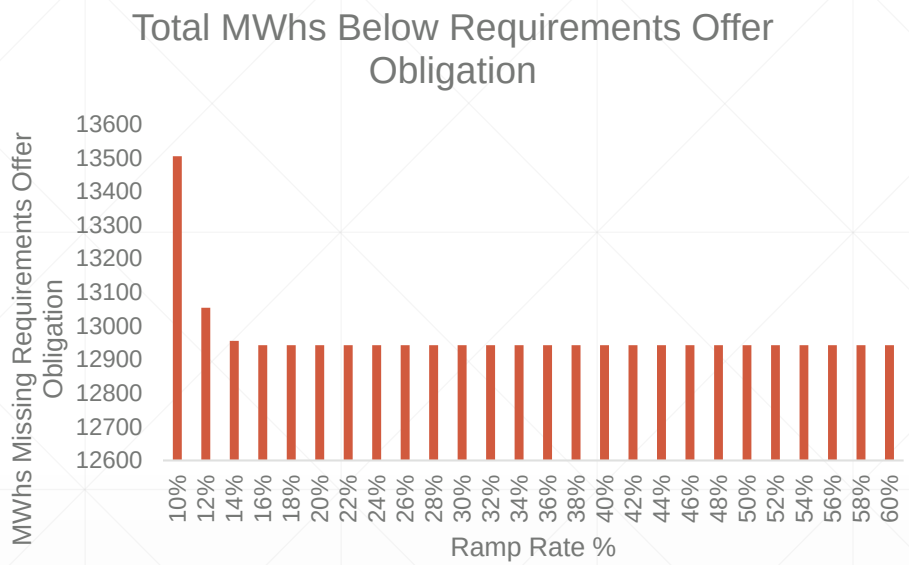

Utility 4 – w/ Usage Constraints
MWhs Missing Requirements Offer Obligation
93600
93400
93200
93000
92800
92600
92400
92200
92000
91800
10% 12% 14% 16% 18% 20% 22% 24% 26% 28% 30% 32% 34% 36% 38% 40% 42% 44% 46% 48% 50% 52% 54% 56% 58% 60%
Ramp Rate %

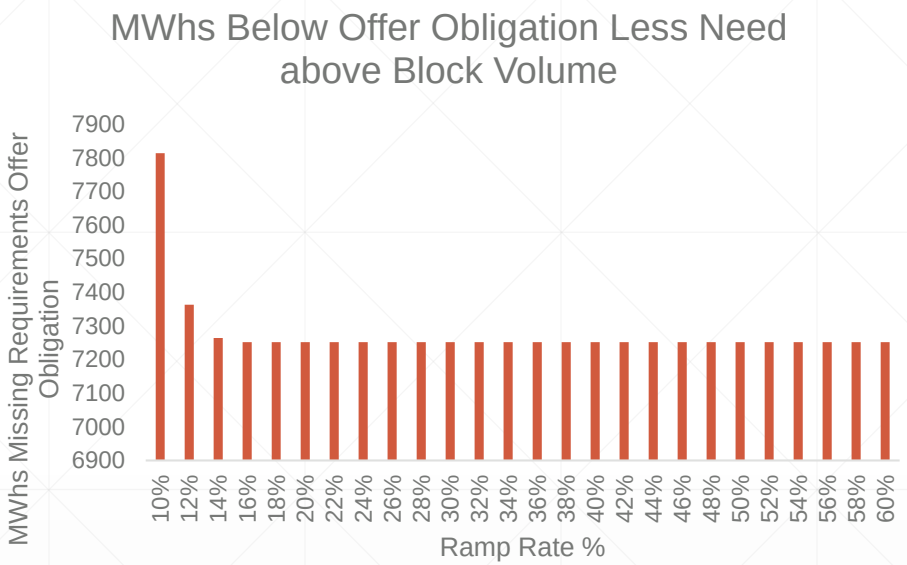

Utility 8 - w/ Usage Constriants
MWhs Missing Requirements Offer Obligation
48000
46000
44000
42000
40000
38000
36000
10% 12% 14% 16% 18% 20% 22% 24% 26% 28% 30% 32% 34% 36% 38% 40% 42% 44% 46% 48% 50% 52% 54% 56% 58% 60%
Ramp Rate %


Utility 4 – No Usage Constraints
MWh Violation
1600000.00%
1400000.00%
1200000.00%
1000000.00%
800000.00%
600000.00%
400000.00%
200000.00%
0.00%
Hours of Violation
2500
2000
1500
1000
500
0
24.61%
6.55%
1.39%
0.15%
0.02%
0.01%
10 20 30 40 50 60
Ramp Rate (%)
Hours
% hours violation
Violation


Utility 8 – No Usage Constraints
MWh Violation
2000000.00%
1500000.00%
1000000.00%
500000.00%
0.00%
Hours of Violation
2500
2000
1500
1000
500
0
24.92%
6.75%
1.50%
0.19%
0.05%
0.02%
10 20 30 40 50 60
Ramp Rate (%)
Hours
% hours violation
Violation

Utility 5 MWhs Below Requirements Offer





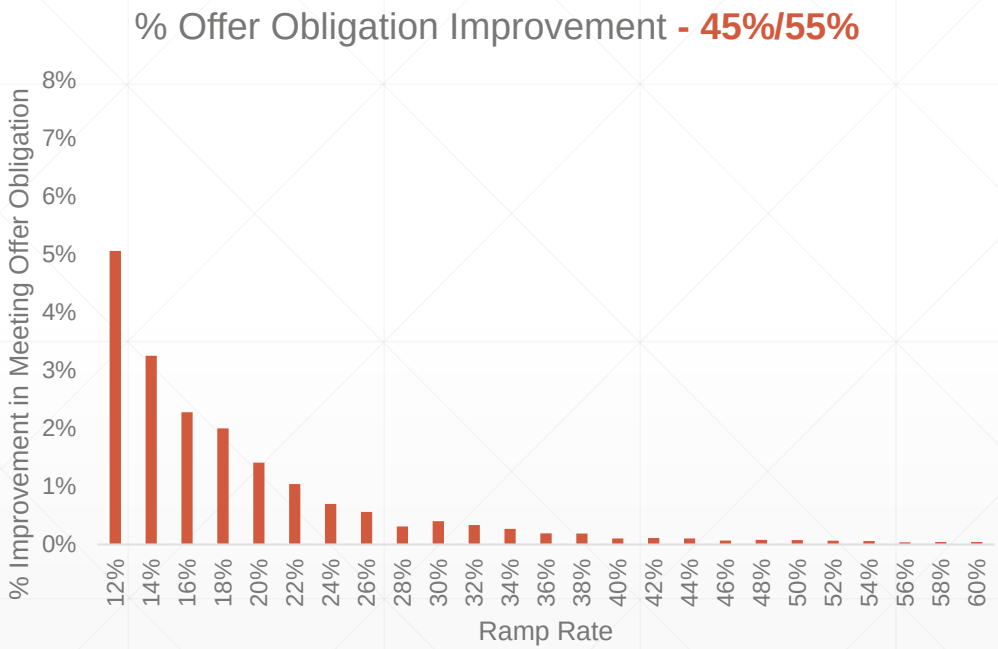
- In some months, the total requirements load is greater than the block volume.
- However, even when this is accounted for, there is still no change in the shape of benefit with ramp rate
- Notably, the requirements obligation miss appears to occur largely in months where the schedule was adjusted to meet the 14-day usage constraint

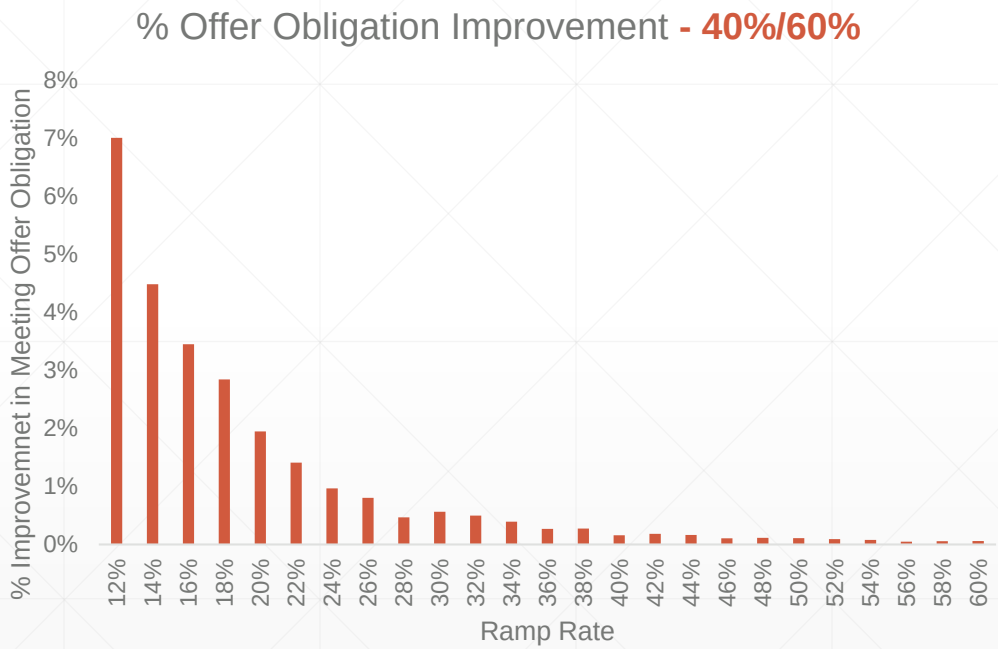
14 Day 45% / 55% usage

- While this analysis was completed with perfect foresight, in real life, limiting the use of block in 1 half of the month is prudent risk management
- However, the 45%/55% limitation is based on the first 14 days of the month
- 14 days is not actually 50% of a month (other than non-leap year February)
- **Therefore, suggest altering the 14-day usage constraint to have a 40% lower limit based on the share of days in a 31-day month, and a 60% upper limit**

Length of month	14 Day % Share of Month	Lower Limit
31 Day Month	45%	40%
30 Day Month	47%	42%
28 Day Month	50%	45%

Impact of 45/55 Usage constraint vs. 40/60 Utility 2 Example





Key Takeaways

- Unlike in Analysis 1 where significant benefit was demonstrated with each incremental increase in ramp rate, the **benefit of increasing ramp rate diminished very quickly with additional constraints**
- Even when controlling for requirements load exceeding block volume, the relative benefit of increasing ramp rate does not change
- One reason that the benefit of increasing ramp rate is limited is that the 14-day usage constraint limits the amount of block used in the first half of the month, especially on the lower limit
- **Suggest a 40%/60% 14-day usage limit**
- Relevant for 1 utility in the analysis, another reason may be due to PNR subtracting out the WRAP QCC of hydro
- Note: Asymmetric or seasonal ramp rates to not appear to provide significant benefit

Other observations: Calculation of Peak Net Requirement

- The current proposed PNR calculation subtracts out QCC of non-federal resources
- While this works for most resources, for storage hydro, this results in a reduction of shaping capacity that is not representative of non-federal storage hydro performance
- **Suggest that the PNR subtracts the expected volume of storage hydro rather than WRAP QCC**
- This is also consistent with current net requirements calculation
- This will also not cause issues in non-WRAP months

Analysis 3: PLVS Capacity Contribution

PLVS Capacity Contribution

- BPA has offered a Peak Load Variance Service up to P10 load
- However, BPA has not defined P10 Load
- PPG requests that **the definition of P10 Load will provide enough capacity to meet with utility WRAP obligations**
- BPA also has not defined how often PLVS may be accessed
- PPG requests that **PLVS may be offered into the Day Ahead Market as needed to meet utility offer obligations**
- Before analysis can be conducted on the effectiveness of PLVS, the volume of PLVS offered and the application of PLVS must be defined