

ETT Outage Scheduling

July 11, 2017



Executive Summary

– ETT CREZ Outage Scheduling –

- **ERCOT protocol section 3.1.5.11 states that ERCOT may approve Outage requests provided the Outage in combination with other proposed Outages does not cause a violation of applicable reliability standards**
- **While we are not inherently opposed to economic optimization of outages, doing so on an ad-hoc basis is problematic**
 - How do we ensure that the optimization is fair and not designed to benefit some participants at the expense of others?
 - What value should be optimized?
 - Who gets to request optimization? Under what circumstances?
- **Even with an unbiased well-designed process uncertainty will increase**
 - Outage schedules will be more volatile
 - Uncertainty will decrease CRR auction revenues



There are many ways one could perform economic optimization, with varying effects to different participants

Economic Optimization Metrics

– Overview –

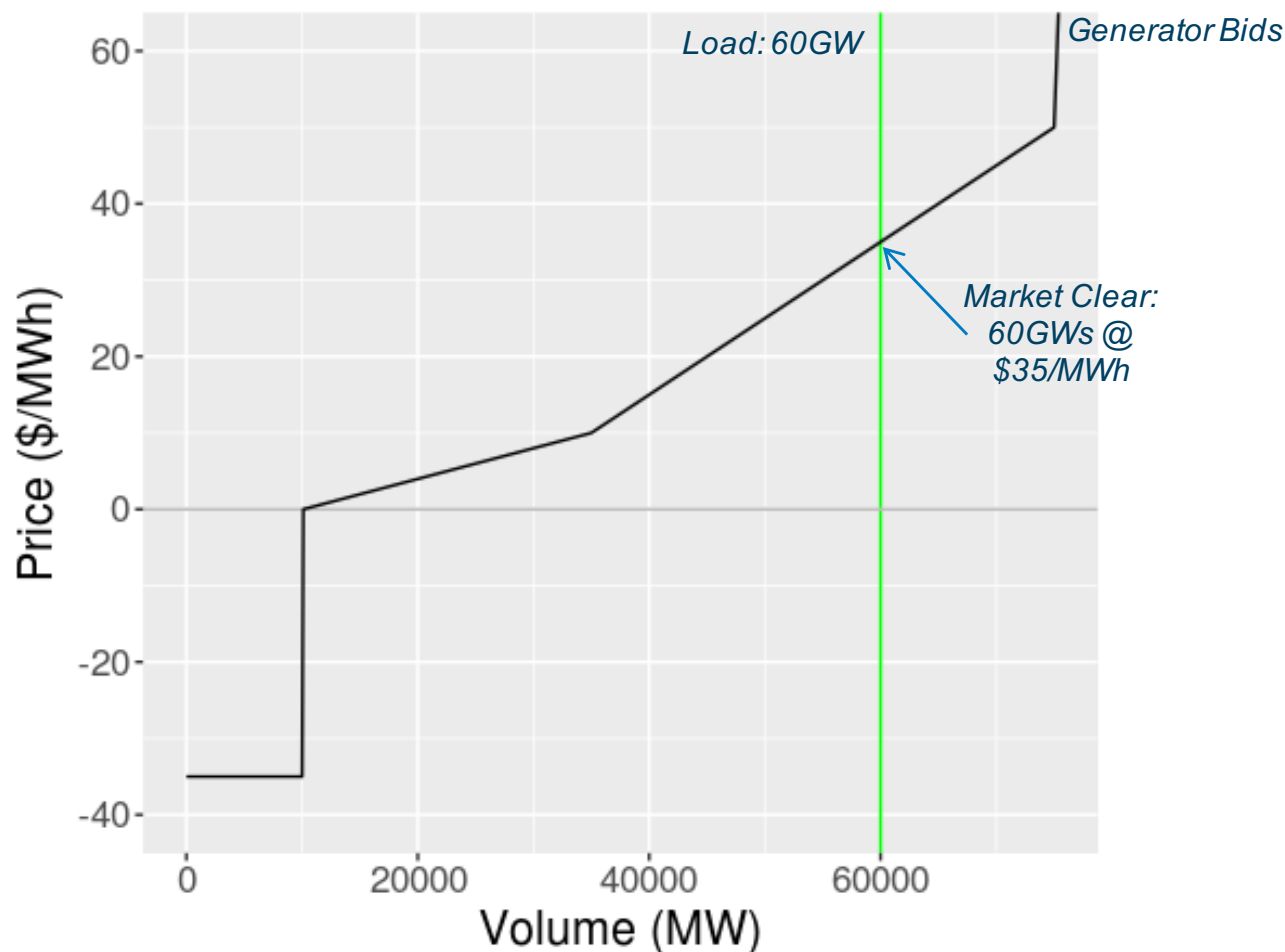
- **Minimizing cost to load**
- **Minimizing as bid cost of production**
 - Appealing because this is the same optimization in the SCED,
 - Although keep in mind probably chosen in SCED because it is computationally convenient and is equivalent to minimizing cost to load (given a particular commitment),
 - However: in a multi period optimization minimizing as bid cost of production does not necessarily minimize cost to load
- **Minimizing congestion**
 - Congestion is recovered by system via CRR settlements and auction revenues so the system should not care about congestion per se
- **The “Optimal” outcomes can vary depending on what metrics are chosen**



Market outcomes are determined by the intersection of the demand (load) and supply (generator stack) curves

Power Market Supply and Demand

– Illustrative Bid Stack¹ –



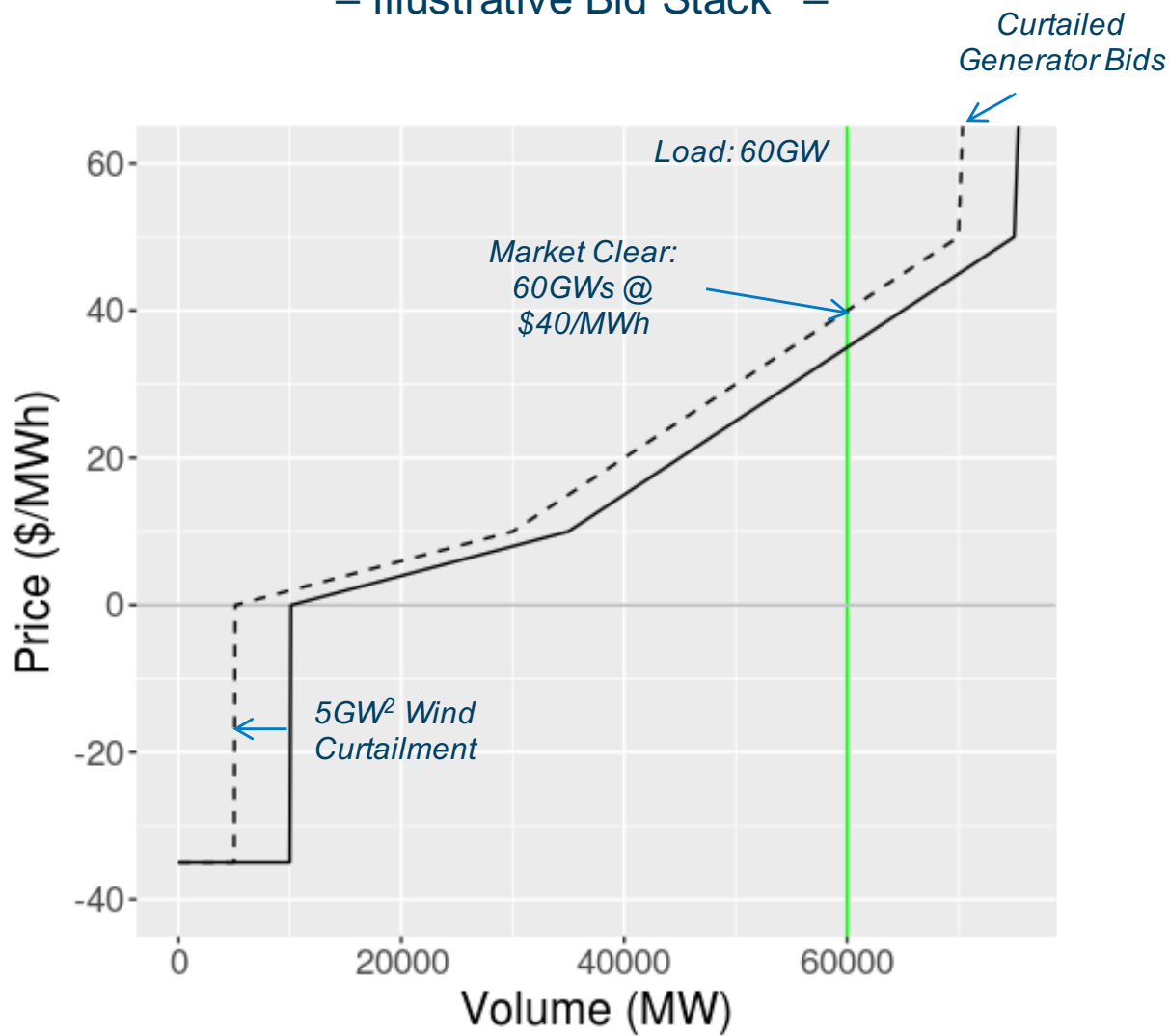
¹ Bid stack roughly representative of an ERCOT bid stack



Curtailment in available generation will cause a rise in market prices, but how do we evaluate the economic impact?

Power Market Supply and Demand

– Illustrative Bid Stack¹ –



¹ Bid stack roughly representative of an ERCOT bid stack

² 5GW much greater curtailment than expected, we only use this number because actual curtailments would be difficult to distinguish visually

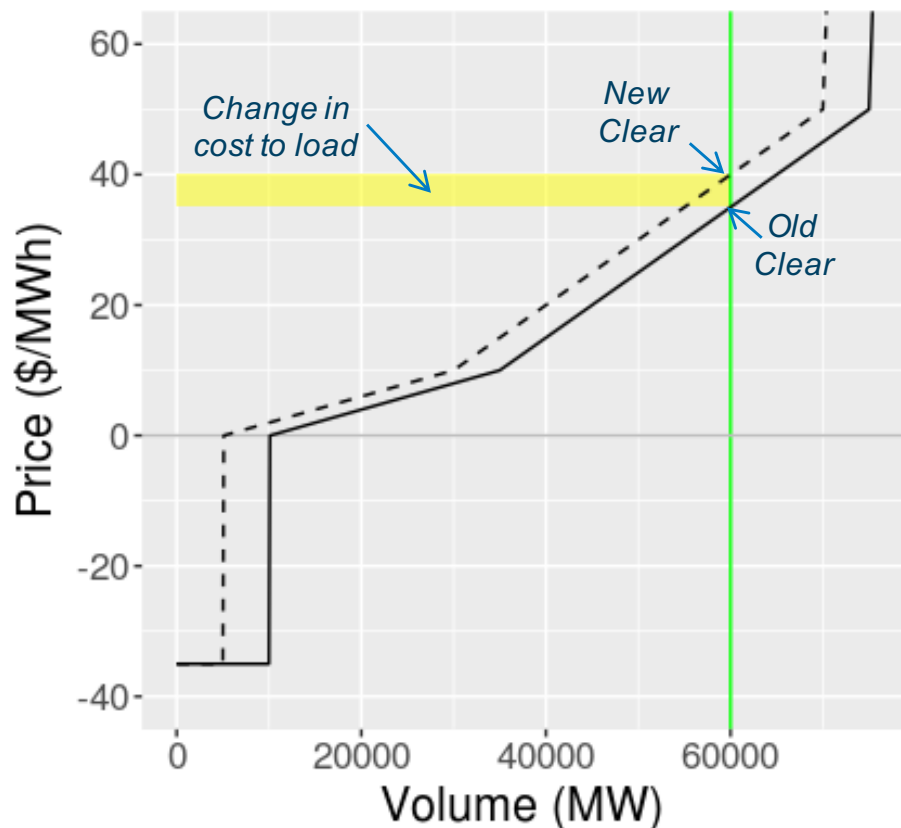


Two possible metrics are the change in cost to load and the change in production cost

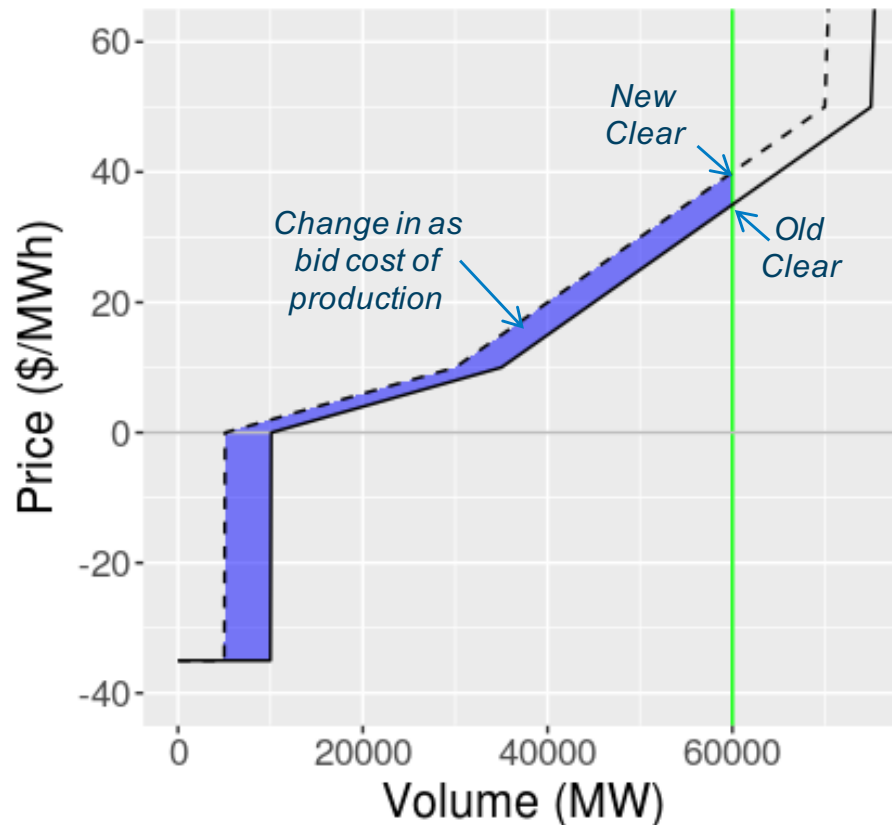
Power Market Supply and Demand

– Illustrative Bid Stack¹ –

Change in Cost to Load



Change in Production Cost



¹ Bid stack roughly representative of an ERCOT bid stack



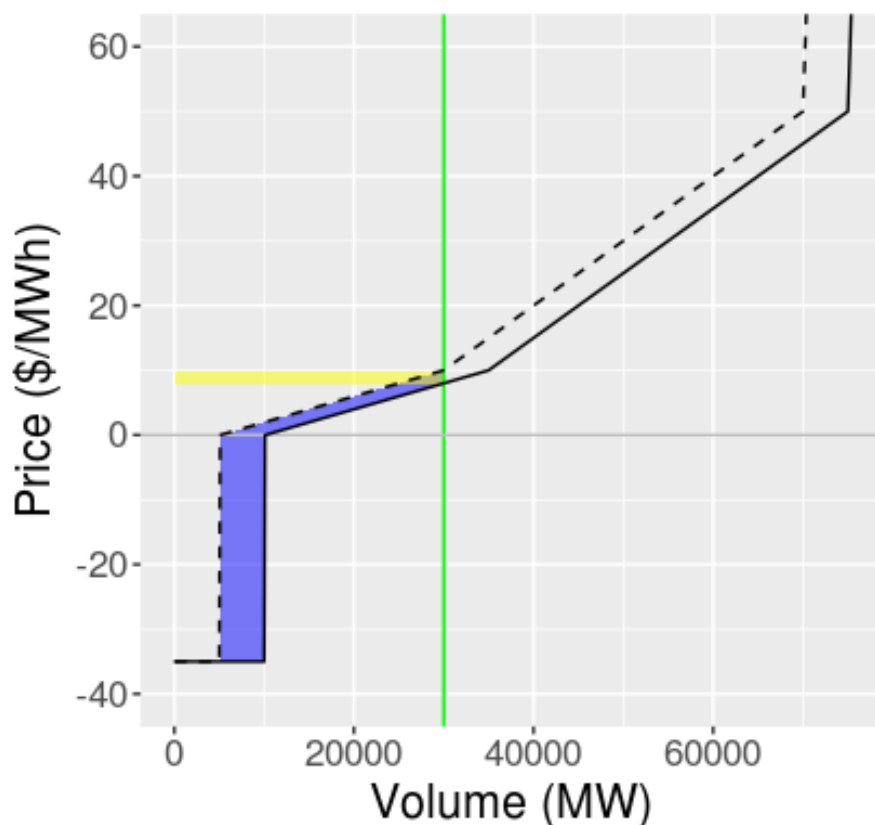
What is better: high curtailments during low load, or low curtailments during high load?

Economic Optimization Metrics

– Illustrative Bid Stack –

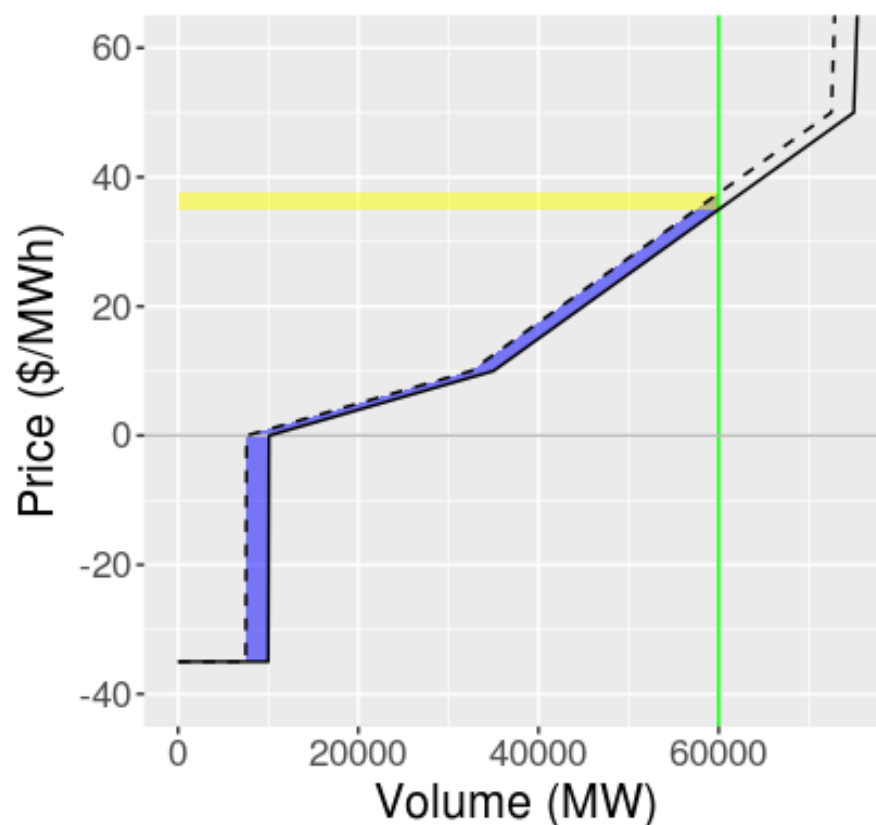
High Curtailment, Low Load

– “Shoulder” Season –



Low Curtailment, High Load

– Summer –

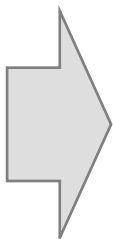
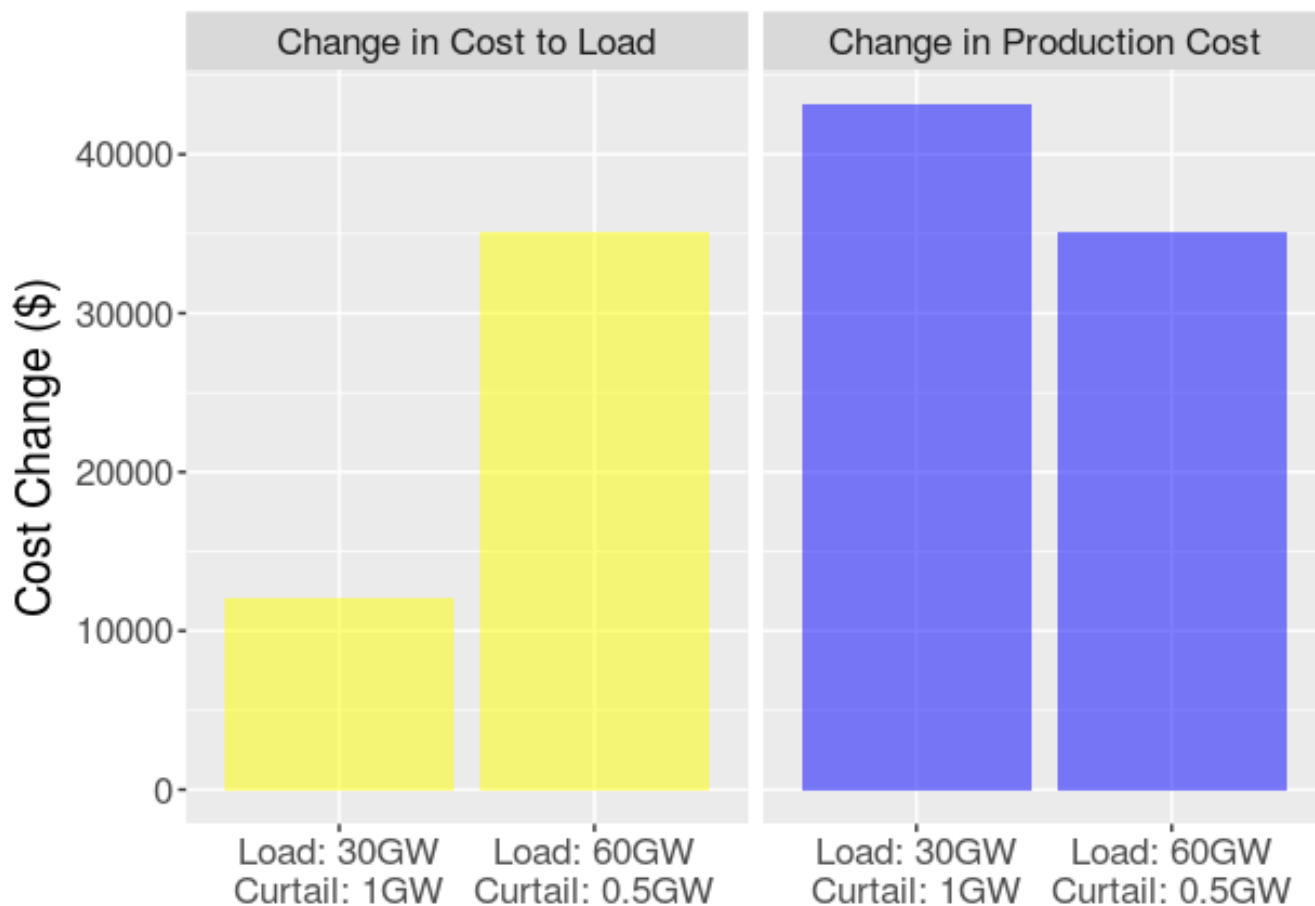




It is not obvious that trading a high curtailment in low load for a low curtailment in high load is the optimal outcome

Economic Optimization Metrics Outcomes

– Illustrative Bid Stack –



*Additionally, there are potential **reliability** concerns from curtailing generation during high load periods that are not relevant in low load periods*



Conclusions

– ETT CREZ Outages Scheduling –

- **Determining how to calculate the optimal economic outcome is non-trivial and sensitive to assumptions**
 - Different assumptions / metrics can lead to different answers
 - E.g. our estimate of the change in cost of production from rescheduling outages is an order of magnitude less than numbers discussed at previous meeting
 - We do estimate high congestion; however for reason discussed previously this is not a valid optimization metric
 - Almost any optimization will result in transfer of wealth from some participants to others
- **Given stakes and effects on participants, any economic optimization should be carried out by a neutral third party with stakeholder approval**
 - Anything else will be subject to participants trying to manipulate the optimization for their own benefit
- **Since outages as scheduled do not cause reliability issues they should remain unchanged absent market consensus on a process for economic optimization of outage schedules**