Valuing Capacity for Resources with Energy Limitations

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Background

In 2012 the NYISO and GE Energy Consulting performed an evaluation of the Contribution to Resource Adequacy of Special Case Resources for the Installed Capacity Subcommittee of the New York State Reliability Council.

This analysis considered:

Penetration

Duration of Use

Persistence of Use

http://www.nysrc.org/pdf/MeetingMaterial/ICSMeetingMaterial/ICS_Agenda135/2012%20SCR%20Study%20Report%20for%20ICS%20-final-05-01-12.pdf

Objective

Build upon the analysis performed for SCRs, expanding the scope to include distributed energy and other resources with energy limitations considering

The impacts of:

- **Duration of Use**
- **Penetration**
- **Persistence of Use**
- **Diversity of Resources**
- **Performance**
- **Seasonal or Daily Limitations**

On Capacity Value as Measured in:

- **Daily Loss of Load Expectation (LOLE - Days/Year)**
- **Hourly Loss of Load Expectation (LOLE Hours/Year)**
- **Loss of energy Expectation (LOEE)**

Approach

GE Energy Consulting will develop a GE MARS post processing routine to schedule resources subject to the parameters listed previously against the hourly NYCA capacity margin for each replication and load level of the GE MARS simulation.

Each replication's hourly NYCA capacity margin will be adjusted by the schedule, and the reliability indices recalculated.

Capacity will be removed until the relevant reliability index is returned to base case levels.

Resource Scheduling

Selecting the Days to Schedule

- Calculate hourly NYCA capacity margin for all replications and load levels
- If seasonal limitations are specified, filter the data to only those days where the resource is available
- Select the worst days for scheduling up to the limit on the number of calls

Resource Scheduling

Selecting the Hours to Schedule

From the days selected for scheduling

- If time of day limitations are specified, filter to only those hours the resource is available
- If duration of use limitations are specified, calculate the rolling total capacity margin for the number of hours allowed, schedule the resource for the period with the minimum total
- If energy limitations are specified, schedule the resource for a block of consecutive hours until the available energy is utilized (starting from the worst hour, schedule outwards to the worst adjacent hour)

Resource Scheduling

Forced Outages and Intermittency

A probability density function (PDF) can be used to specify the probability a unit is at a given percentage of its output.

The scheduling tool will determine, based on this PDF and a randomly drawn number, what the output will be in any hour.

The PDF used can be specified by hour of the day and by month.

Resource Scheduling

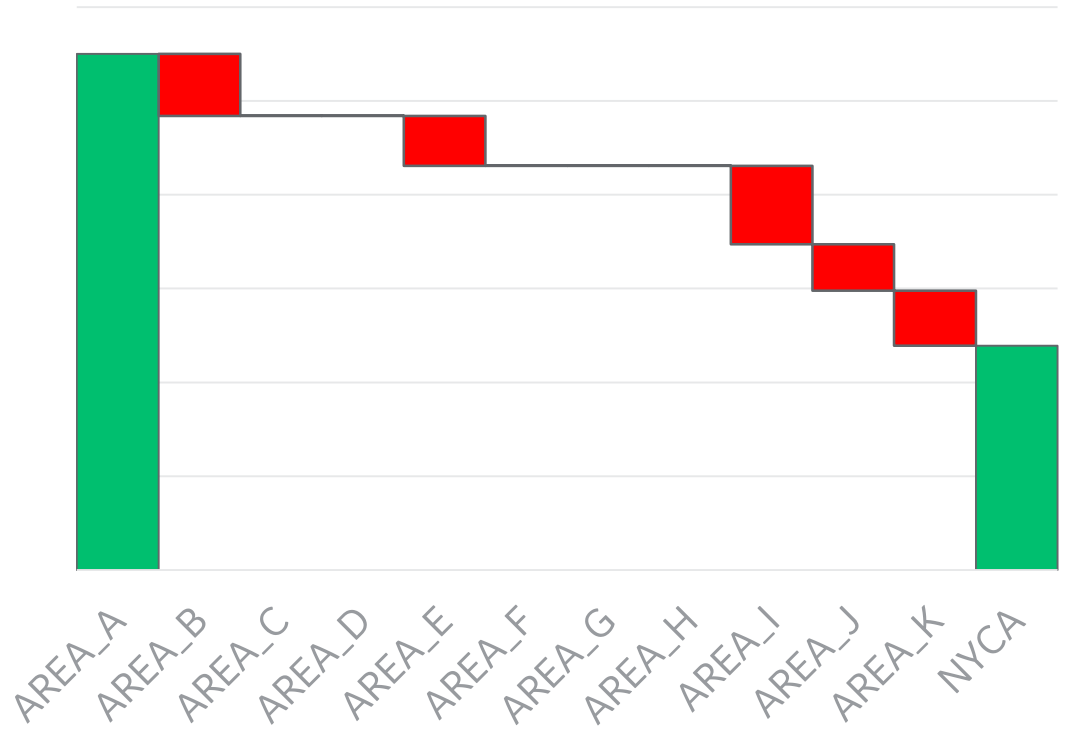
Calculating Net Capacity Margin for Ranking

Discussion

Because loss of load events can occur due to transmission constraints, it is possible for NYCA to have a positive net margin and a loss of load

For such hours, only the negative area's margins will be counted towards ranking days / hours for scheduling

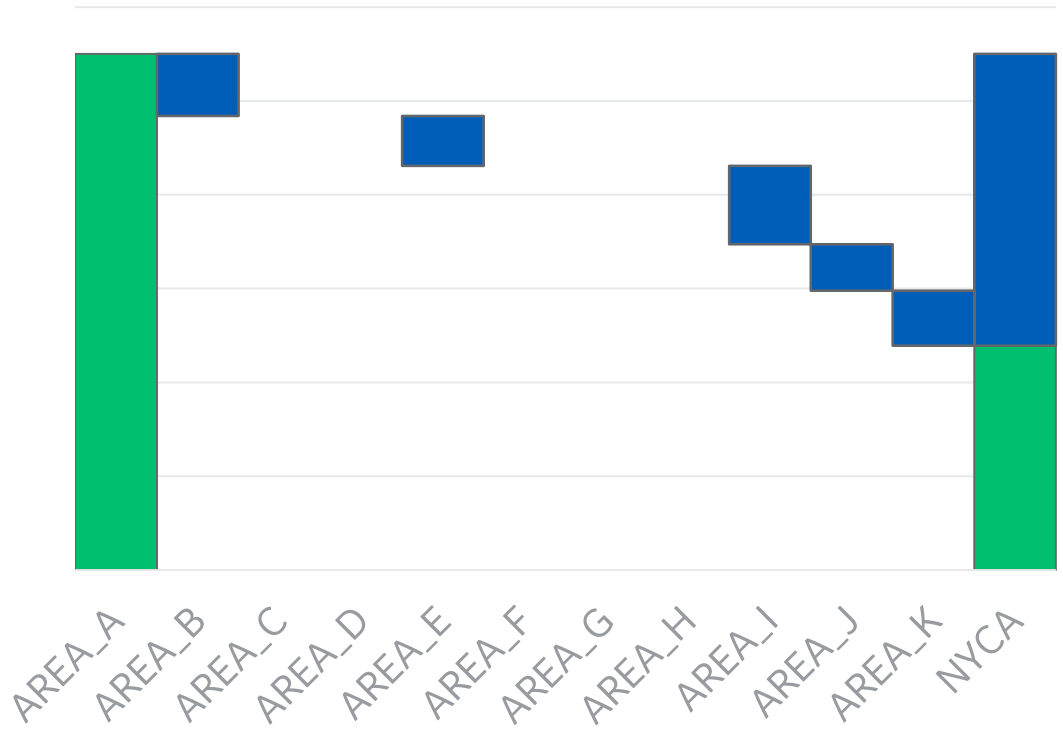
Sample Loss of Load Event Caused by Transmission



Resource Scheduling

Distribution of capacity among NY Areas

Negative Areas will be scheduled first



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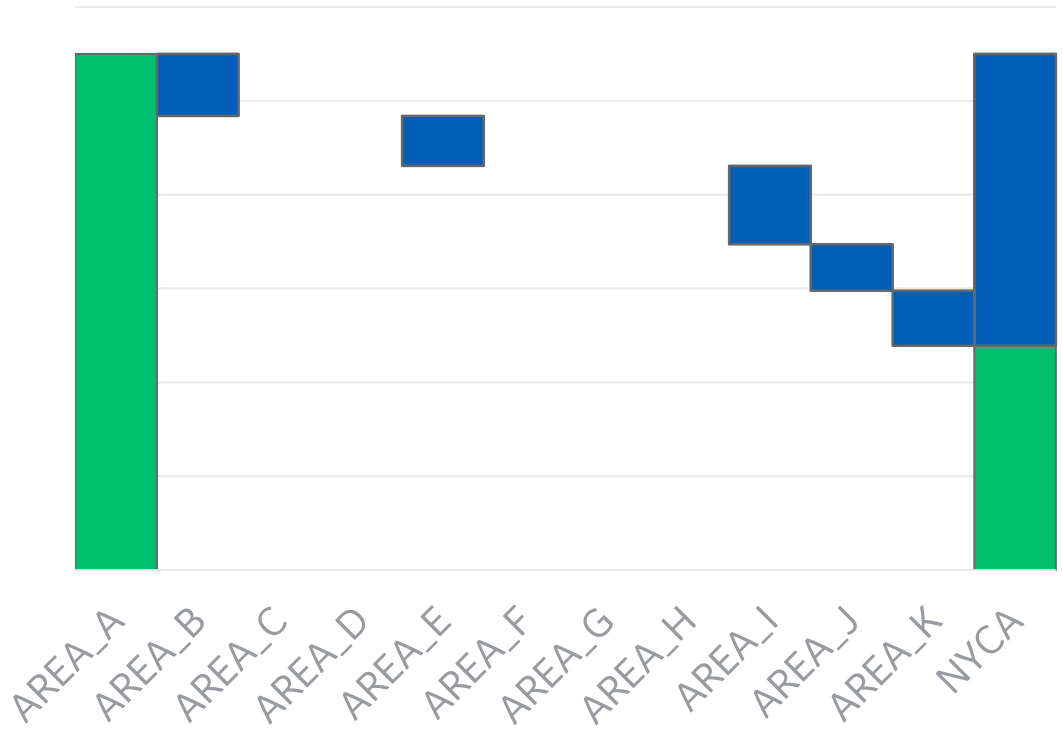
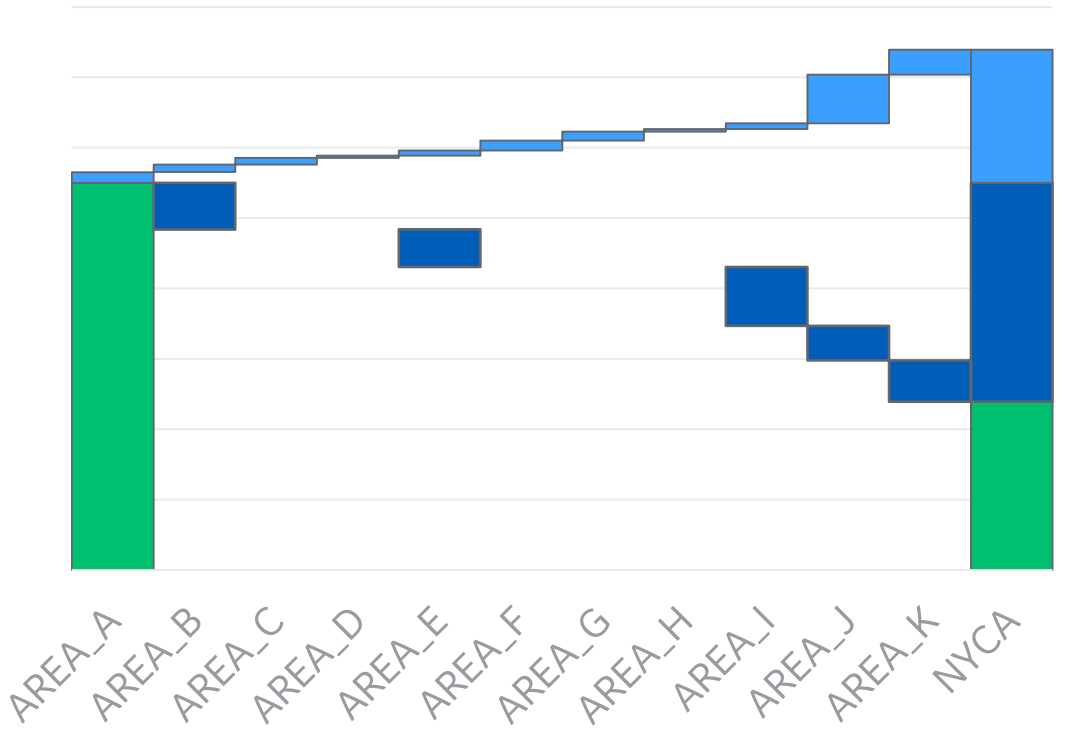


Capacity will then be scheduled proportional to load



Capacity Removal

A constant amount of capacity is removed from all hours to calculate capacity value

1) If the resource is scheduled in the hour, remove capacity from NY Areas proportional to the capacity added
2) If the resource is not scheduled and all NY Areas have capacity margins greater than or equal to zero, remove capacity from NY Areas proportional to the surplus
3) If the resource is not scheduled and any NY Area has a capacity margin less than zero, remove capacity proportional to base case UCAP

Progress and Next Steps

Progress:

- A tool has been developed which applies the logic described
- We have tested the tool on a simple 10 replication case, but experience issues scaling up to a full set of simulation results

Next Steps:

- Scale the tool developed to date to calculate capacity value for a full set of simulation results
- Run the post processing tool developed for a range of energy limitation parameters on the 2018 IRM Base Case and 2018 IRM High Wind High Solar Case