EE 491 WEEKLY REPORT 9

November 1 - 7

Power system reliability in MISO for high wind/solar levels

Group 23

Client: Midcontinent Independent System Operator

Team Members:

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WEEKLY SUMMARY

This week, the team completed the ranking system for siting so that they can present this to MISO at the meeting on Friday, November 9th. The team completed the equation for how to rank each site, and now just needs to set the percentage criteria for each technology and complete the actual ranking to 'fill' the busses. MISO gave the team an upper limit of 200 MW per bus, so this will be the max number to used fill as many of the busses as possible after they are ranked. The team plans to fill the busses with 200 MW until the target total MW generated is met, which is different for each percentage of renewables and for each technology (fixed solar, tracking solar, rooftop solar, and wind).

The team calculated four different equations for the four different technologies. As a reminder, these technologies are wind, rooftop (solar), tracking (solar), and fixed (solar). We needed different equations for each because different statistics for different areas will affect the technologies (if there is a push for wind in a certain region, for example).

All numbers used in the equation were scaled to be between 0 and 1, so they would represent percentages. See below screen shots of the excel file we used to rank the busses.

| G4 | | fx | =B4*0.7+D4*0.15+E4*0.1+F4*0.05 | | | | | |

	A	B	C	D	E	F	G	H	I
1	This Siting ranking is based on an equation that is based on Capacity Factor at 70%, Population density in county at 15%, Capacity value at 10%, and the Queue at 5%								
2									
3	Bus Number	Capacity Factor	Population density in County	Pop Density Rank	Capacity Value	Queue Rank	Wind Rank Equation	Lat wind	Lon wind
4	568231	0.555021528	24.3	1	0.266248333	0.1	0.570139903	45.521	-87.342
5	548107	0.550553329	24.3	1	0.09465	0.1	0.54985233	45.501	-87.333
6	550061	0.530973576	24.3	1	0.132536667	0.1	0.53993517	45.323	-87.526

For the wind equation the Capacity Factor is weighted at 60%, Population density in county weighted at 25%, and Capacity value at 15%

| G4 | | fx | =B4*0.6+E4*0.25+F4*0.15 | | | |

	A	B	C	D	E	F	G
1	This Siting ranking is based on an equation that is based on Capacity Factor at 60%, Population density in county at 25%, and Capacity value at 15%						
2							
3	Bus Number	Capacity Factor	Population density in County	Population	Pop Density Rank	Capacity Value	Rank equation
4	250050	0.162608015	223.9	233740	0.15	0.373638333	0.191110559
5	250056	0.163460968	56.6	34869	0.05	0.397833333	0.170251581
6	250512	0.169855917	82.9	96318	0.05	0.385426667	0.17222755
7	250714	0.173302459	31.1	39566	0	0.43241	0.168842975
8	250727	0.167589795	40.8	22802	0	0.415276667	0.162845377

For the rooftop equation the Capacity Factor is weighted at 60%, Population density at 25%, and Capacity value at 15%

| G4 | | fx | =B4*0.7+D4*0.1+E4*0.15+F4*0.05 | | | | |

	A	B	C	D	E	F	G	H
1	This Siting ranking is based on an equation that is based on Capacity Factor at 70%, Population density in county at 10%, Capacity value at 15%, and the Queue at 5%							
2								
3	Bus Number	Capacity Factor	Population density in County	Pop Density Rank	Capacity Value	Queue Rank	Rank equation	
4	263469	0.184018436	60.5	1	0.473028333	0.5	0.324767155	
5	365332	0.185184151	83.4	1	0.529918333	0.3	0.324116656	
6	261755	0.19573906	7.6	1	0.502793333	0.2	0.322436342	

For the tracking equation the Capacity Factor is weighted at 70%, Population density at 10%, Capacity value at 15%, and the Queue at 5%

| | | | fx | =B4*0.7+D4*0.1+E4*0.15+F4*0.05 | | | | |

A	B	C	D	E	F	G	H
This Siting ranking is based on an equation that is based on Capacity Factor at 70%, Population density in county at 10%, Capacity value at 15%, and the Queue at 5%							
Bus Number	Capacity Factor	Population density in County	Pop Density Rank	Capacity Value	Queue Rank	Rank equation	
264299	0.16747898	89.8	1	0.164331667	0.1	0.246885036	
274305	0.167450407	89.8	1	0.164331667	0.1	0.246865035	
294876	0.167260133	89.8	1	0.164331667	0.1	0.246731843	

For the fixed equation the Capacity Factor is weighted at 70%, Population density at 10%, Capacity value at 15%, and the Queue at 5%

These rankings will be used to finalize how the team will place the different generators on the grid in the future. This is also how the team intends to create the model in PLEXOS that will estimate what the grid will look like with different penetration levels of renewable energy up to 100% penetration.

ACCOMPLISHMENTS FOR THE WEEK

Name	Accomplishments	Hrs this week	Total
Zaran Claes	-Tried to assist in getting PLEXOS on computers -Researched possible siting criteria	10	46
David Ticknor	-Worked on formulating Queue ranking -Initial drafting on siting template / formatting for Excel -Worked through PLEXOS primer given by Dr. McCalley	12	65
Shannon Foley	-Completed the Siting ranking document that used an equation that I created to rank every bus -Worked with Ian and David to formulate how to incorporate the Queue into the equation	11	56
Ian Rostkowski	-Calculated and compiled capacity values for all years to be used in siting requirements -Collaborated with Shannon and David to finalize the siting calculation sheet in excel	11	57
Shelby Pickering	- Met with team to further discuss siting and to-do's -Searched and documented relevant state energy policies for ranking siting -Kept on task with class assignments i.e. lightning talk and weekly reports	8	48.5
Matt Huebsch	-Wrote minutes for meeting 9 -Worked on heat map for Capacity Factors	4	48

PENDING ISSUES

- The team is awaiting the PLEXOS license for the VM.

PLANS FOR NEXT WEEK

Next week the design team will have the siting done and will present it to MISO at their meeting on Friday, November 9th. The next steps are to clean up the odds and ends of siting and start really getting the PLEXOS ball rolling. The team will need to learn and begin utilizing PLEXOS. The team will also need to re-visit the schedule for this semester to determine what else is a goal to get done before we present our work for the semester.

INDIVIDUAL CONTRIBUTIONS FOR NEXT WEEK

Zaran Claes – Create working plan for how we'll use PLEXOS once siting is done for sure. Assist in any more siting work that has to be done

David Ticknor – Will site all techs and buses. Will continue working with PLEXOS to understand it and how we can utilize it best for our project.

Shannon Foley -   Finish up completing the VM. Preform a formal Plexos workshop

Ian Rostkowski – Now that siting criteria is established and an excel sheet that can properly rank busses has been conceived, the next step is using the calculations sheet for each renewable tech and systematically organizing the amount of generation to be added to each bus for the varying energy penetration levels. Will look further into this next week.

Shelby Pickering – Next week I would like to accomplish more siting as well as get my hands dirty in Plexos to keep things moving on that front.

Matt Huebsch - Write Minutes for meeting 10. Fix the arrangements of documents in our timeline folders. Help with the Design Document and the Project Plan. Research personal laptops in order to download PLEXOS. Start looking into and working with PLEXOS.