

Overview of Task 9 Activity for EIPC Production Cost Modeling

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The results presented herein use modeling assumptions developed by EIPC, EIPC stakeholders and CRA for purposes of EIPC capacity expansion modeling. As such, these results do not necessarily reflect the opinions or views of CRA or any individual EIPC stakeholder.

Overview

- CRA is using the GE MAPS model to evaluate the 2030 production cost of Scenarios 1, 2, and 3, along with six additional sensitivities.
 - GE MAPS is a detailed economic dispatch and production cost model that simulates the operation of the electric power system taking into account transmission topology.
 - The model footprint comprises the Eastern Interconnect, and includes the generating units and the transmission load flow and flowgates for each scenario from Tasks 7 and 8.
- Using the EIPC stakeholder-approved input assumptions into GE MAPS as approved in July, and the results of Task 7 and 8, CRA has completed preliminary modeling of:
 - S3 Base (Business as Usual)
 - S1 Base (Combined Federal Climate and Energy Policy)
- Each model run takes between 1 and 3 days to solve, once all input assumptions have been set.
- Using a completely new generating unit set, load flows, and flowgates in GE MAPS has been a challenging process.

Output Reports

- Output reports (Reports “A” through “F”) have been formulated and provided to stakeholders that include:
 - Annual 2030 data
 - *Generation output, emissions, fuel costs, variable O&M costs, and emission costs by generating type by NEEM region*
 - *DR use by NEEM region and wind curtailment by NEEM region*
 - *Flow on DC lines and tie-lines between NEEM regions*
 - *Flowgate congestion*
 - Hourly 2030 data
 - *Loads and load LMPs*
 - *Flow on DC lines and tie-lines between NEEM regions*
 - *Flowgate congestion*
 - *Generation by type by NEEM region*

High-Level Summary of Preliminary Results

- Generation by Capacity Type for the EI in 2030 is shown below for S1 Base and S3 Base
 - Overall results are fairly close to the Phase 1 Results

	Generation (TWh)		% of Total Supply	
	S1 Base	S3 Base	S1 Base	S3 Base
Coal	41	1,398	1%	38%
Nuclear	1,094	903	37%	24%
CC	755	838	25%	23%
CT	39	40	1%	1%
Steam Oil/Gas	6	17	0%	0%
Hydro	205	201	7%	5%
On-Shore Wind	722	209	24%	6%
Off-Shore Wind	6	6	0%	0%
Other Renewable	59	53	2%	1%
Pump Storage Net	-8	-4	0%	0%
DR	3	1	0%	0%
Total Generation	2,923	3,661	98%	99%
External Supply	52	35	2%	1%
Total	2,975	3,696	100%	100%

High-Level Summary of Preliminary Results

- Production Costs, Emissions, and Wind Curtailment for the EI in 2030 is shown below for S1 Base and S3 Base
 - Wind is curtailed when prices (LMPs) at the unit's location falls below \$1/MWh.

Production Costs (M\$)		
	S1 Base	S3 Base
Fuel	42,515	85,542
Variable O&M	6,402	18,404
CO2	45,367	138
Total	94,284	104,084
Emissions (short tons)		
	S1 Base	S3 Base
SO2 (000)	93	1,125
NOx (000)	22	1,767
CO2 (millions)	358	1,796
Wind Curtailment		
	S1 Base	S3 Base
Wind Curtailment (TWh)	135	1
Percent Curtailed	16%	0%

High-Level Summary of Preliminary Results

- Wind curtailment by NEEM region in S1 Base takes place predominately in three regions.

	Potential Wind Energy	Generated Onshore Wind Energy	Generated Offshore Wind Energy	Curtail- ment	Wind Generated as % of Demand
ENT	1	1	0	0	0%
FRCC	0	0	0	0	0%
MAPP_US	32	28	0	4	99%
MISO_IN	28	28	0	1	30%
MISO_MI	24	24	0	0	27%
MISO_MO-IL	32	24	0	8	26%
MISO_W	261	195	0	66	149%
MISO_WUMS	9	9	0	0	16%
NE	55	34	0	22	111%
NEISO	18	16	2	0	15%
NonRTO_Midwest	0	0	0	0	0%
NYISO_A-F	19	19	0	1	34%
NYISO_G-I	1	1	0	0	4%
NYISO_J-K	0	0	0	0	0%
PJM_E	6	2	4	0	3%
PJM_ROM	6	6	0	0	3%
PJM_ROR	44	43	0	0	9%
SOCO	0	0	0	0	0%
SPP_N	146	126	0	20	165%
SPP_S	148	142	0	6	92%
TVA	0	0	0	0	0%
VACAR	9	9	0	0	4%
IESO	21	15	0	6	12%
MAPP_CA	1	1	0	0	3%
EI	863	722	6	135	24%

S3 Base (Business as Usual)

- Preliminary S3 Base Results were provided to the MWG on September 10. On-going reviews of the outputs have been conducted by both the EIPC and by the MWG.
- Based on these reviews, a number of issues have been identified for refinement in the final iteration of S3 Base, including:
 - Remove a NEISO hydro unit that should not be there, and correct 4 units to CC instead of CT
 - Incorporate a SOCO terminal upgrade
 - Correct a SOCO hydro unit to be pumped storage hydro
 - Correct CO₂ RGGI price
 - Refine NY Zone J and K constraints
 - Include PJM-E to NY DC Cable
 - Correct MAPP minimum gen level for hydro units
 - IESO generating units and flowgate refinements
 - South Carolina to SOCO transmission refinement
 - GRE-area DC line refinement
 - Biomass pricing correction
- Other than possibly in the Southeast (SOCO/SC/FL), we don't anticipate a significant difference in overall results from these changes.

S1 Base (Combined Federal Climate and Energy Policy)

- Preliminary S1 Base Results were provided to the MWG on September 17. On-going reviews of the outputs are being conducted by both the EIPC and by the MWG.
 - With the additional wind and new DC lines, S1 takes much longer for GE MAPS to solve.
- Issues identified thus far for refinement in the final iteration of S1 Base, include:
 - South Carolina to SOCO transmission refinement

Next Steps

- Base Runs
 - Run S2 Base (National RPS – State/Regional Implementation) and issue results to stakeholders
 - Complete refinement run of S3 Base
 - Complete refinement run of S1 Base
- SSC to identify six sensitivities to be conducted
- Complete sensitivities and issue results to stakeholders