

Overview of Results for the EIPC Future 5 Sensitivities and the Future 6, 7, and 8 Base and Soft Constraint Cases

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CRA Charles River
Associates

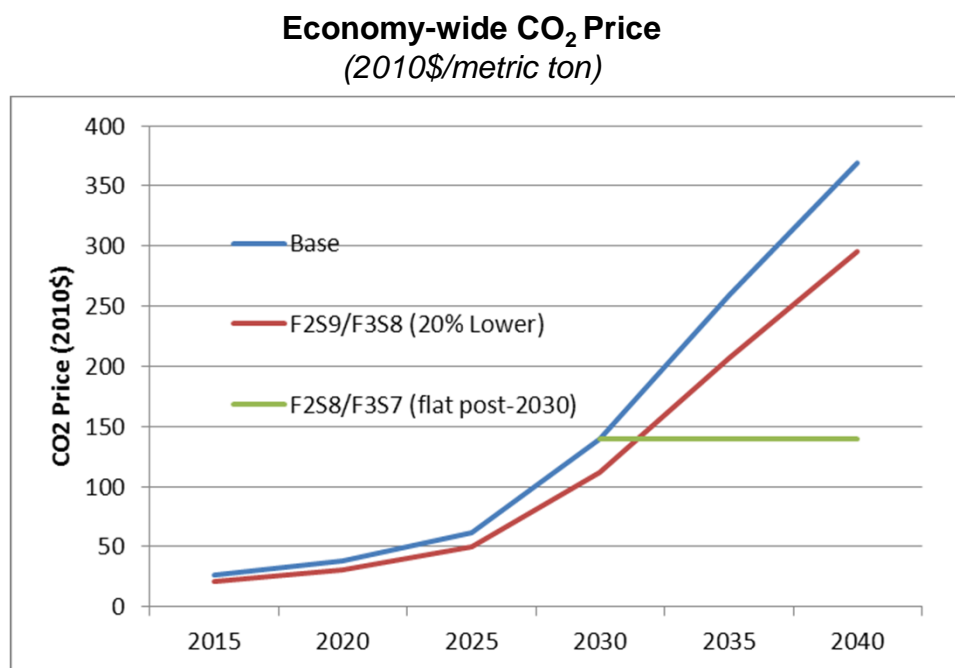
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Overview

- Using the EIPC stakeholder-approved input assumptions, CRA has completed modeling of:
 - Futures 2 and 3 “Federal Carbon Constraint” for:
 - *F2S8 and F3S7 (alternative low CO₂ price) and F2S12 and F3S13 (50% intermittency penetration)*
 - Future 5 “National RPS – Top Down Implementation” for:
 - *F5 Sensitivities: F5S3 through F5S10 (F5S6 was moved to F2) using Hard Limits.*
 - Future 6 “National RPS – State/Regional Implementation” for:
 - *Future 6 Base and 25% Soft Constraint Sensitivity (F6B and F6S1)*
 - Future 7 “Nuclear Resurgence” for:
 - *Future 7 Base and 25% Soft Constraint Sensitivity (F7B and F7S1)*
 - Future 8 “Combined Federal Climate and Energy Policy” for:
 - *Future 8 Base and 75% and 25% Soft Constraint Sensitivities (F8B, F8S1 and F8S2)*
- Of the 80 total runs, 64 have now been completed.

Future 2 and Future 3 Additional Sensitivities

- Carbon prices applied in the Future 2 and Future 3 sensitivities now include the F2S8 and F3S7 sensitivities in which prices after 2030 remain constant in real terms.



- Sensitivity cases with wind/solar regional intermittency limits increased from 35% to 50% were also conducted for Future 2 (F2S12) and Future 3 (F3S13)

Future 2 Results with F2S8 and F2S12

- Total EI capacity in 2030 is shown below by type for Future 2 (Federal Carbon – National Implementation) in comparison to the BAU, now including the new F2S8 and F2S12 sensitivities.
 - *CCS retrofits are less economic leading to more coal retirements in F2S8 relative to F2S11, yielding less coal and more CCs.*
 - *More wind is constructed with the higher (50%) intermittency limits in F2S12.*

Installed 2030 EI Capacity by Type: BAU vs. Future 2 (GW)

	Installed Capacity in 2030													
	F1S3	F2B	F2S1	F2S2	F2S3	F2S4	F2S5	F2S6	F2S7	F2S8	F2S9	F2S10	F2S11	F2S12
	BAU	Fed	75%	25%	50%	High	Low	ExHi	Low	Flat	Low	ExLo	Hard	High
Total	BAU	Fed	75%	25%	50%	High	Low	ExHi	Low	Flat	Low	ExLo	Hard	High
2010	Base	CO2	Soft	Soft	Fric	Load	Load	Gas	Gas	CO2	CO2	Rnw\$	Limit	Intm
Coal	272	199	29	30	30	69	16	83	22	12	34	33	31	28
Nuclear	100	105	133	130	129	132	136	127	135	105	127	114	134	130
CC	133	202	246	230	224	226	306	166	170	265	249	240	213	225
CT	120	132	106	115	116	112	128	100	113	120	114	119	113	112
Steam Oil/Gas	75	36	22	27	28	29	35	9	21	27	28	28	29	29
Hydro	45	45	50	51	52	51	52	47	51	49	51	51	52	50
On-Shore Wind	19	68	282	313	315	320	385	232	348	243	312	279	357	349
Off-Shore Wind	0	2	2	2	2	2	2	2	2	2	2	3	2	2
Other Renewable	4	14	13	13	14	13	14	12	21	13	13	12	13	13
New HQ/Maritimes	0	0	0	0	3	3	3	3	3	3	3	3	3	3
Other	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Total w/o DR	783	819	901	927	930	934	1,147	731	965	866	928	898	967	959
DR	33	71	71	71	71	71	85	58	71	71	71	71	71	71
Total w/DR	816	890	971	998	1,000	1,005	1,232	789	1,035	937	998	969	1,037	1,029

Future 3 Results with F3S7 and F3S13

- Total EI capacity in 2030 is shown below by type for Future 3 (Federal Carbon – Regional/State Implementation) in comparison to the BAU, now including the new F3S7 and F3S13 sensitivities.
 - Trends are similar to those in the additional F2 sensitivities, e.g., more wind is constructed with the higher (50%) intermittency limits in F2S13.*

Installed 2030 EI Capacity by Type: BAU vs. Future 3 (GW)

	Installed Capacity in 2030														
		F1S3	F3B	F3S1	F3S3	F3S4	F3S5	F3S6	F3S7	F3S8	F3S9	F3S10	F3S11	F3S12	F3S13
	Total 2010	BAU Base	Reg CO2	75% Soft	High Load	Low Load	ExHi Gas	Low Gas	Flat CO2	Low CO2	Hi \$ Nuke	HiCN Impt	ExLo Rnw\$	Hard Limit	High Intm
Coal	272	199	40	35	66	18	82	24	12	33	39	38	34	39	33
Nuclear	100	105	134	134	137	132	134	105	133	112	105	134	128	134	133
CC	133	202	256	256	335	185	190	287	279	267	269	253	229	252	247
CT	120	132	104	105	128	84	104	118	108	115	116	105	107	105	106
Steam Oil/Gas	75	36	18	18	30	11	17	19	18	24	18	18	25	18	20
Hydro	45	45	52	52	52	49	53	50	52	51	52	51	53	52	51
On-Shore Wind	19	68	199	195	233	156	213	151	185	170	198	193	215	197	254
Off-Shore Wind	0	2	2	2	2	2	10	2	2	2	2	2	59	2	2
Other Renewable	4	14	13	13	14	12	33	13	13	13	13	13	26	13	13
New HQ/Maritimes	0	0	0	3	5	3	5	3	5	3	5	4	4	5	4
Other	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Total w/o DR	783	819	833	829	1,019	668	857	789	821	807	833	829	897	833	879
DR	33	71	71	71	85	58	71	71	71	71	71	71	71	71	71
Total w/DR	816	890	904	900	1,105	726	927	860	892	878	904	900	968	903	950

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Future 5 (National RPS – Top Down) Results

- Total EI capacity in 2030 is shown below by type for Future 5 (National RPS – Top Down Implementation) in comparison to the BAU.
 - F5S10 (Hard limits) builds are close to F5S2 (25%). Hard limits are used in F5S3 through F5S10.
 - 50% hurdles (F5S8) does not change the overall EI builds by type significantly.
 - Clean Energy Standard (F5S5) of 70% by 2030 increases coal retirements, reduces wind builds and increases CC and nuclear builds relative to F5S10.

Installed 2030 EI Capacity by Type: BAU vs. Future 5 (GW)

	Installed Capacity in 2030											
		F1S3	F5B	F5S1	F5S2	F5S3	F5S4	F5S5	F5S7	F5S8	F5S9	F5S10
	Total	BAU	Nat	75%	25%	High	High	Fed	Incr	50% OffSh	Hard	
2010	Base	RPS	Soft	Soft	Load	Gas	CES	PHEV	Hurd	Wind	Limit	
Coal	272	199	177	175	174	192	224	103	180	181	179	179
Nuclear	100	105	105	105	105	105	105	116	105	105	105	105
CC	133	202	167	167	167	235	153	215	170	161	166	166
CT	120	132	136	136	143	185	125	157	151	142	139	140
Steam Oil/Gas	75	36	38	39	39	47	22	43	40	39	37	38
Hydro	45	45	52	51	51	53	51	51	51	51	51	51
On-Shore Wind	19	68	236	220	216	284	216	163	224	216	197	217
Off-Shore Wind	0	2	2	2	2	2	2	2	2	2	20	2
Other Renewable	4	14	13	13	13	15	13	13	14	13	13	13
New HQ/Maritimes	0	0	0	6	6	6	6	3	6	6	6	6
Other	17	17	17	17	17	17	17	17	17	17	17	17
Total w/o DR	783	819	942	931	933	1,139	933	884	959	934	930	933
DR	33	71	71	71	71	85	71	71	76	71	71	71
Total w/DR	816	890	1,013	1,002	1,004	1,224	1,004	955	1,035	1,004	1,000	1,003

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Future 5 Results (cont.)

- EI new capacity in 2030 is shown below by NEEM region for Future 5 in comparison to the BAU.

2030 EI New Builds by Region: BAU vs. Future 5 (GW)

	Cum New Builds in 2030										
	F1S3	F5B	F5S1	F5S2	F5S3	F5S4	F5S5	F5S7	F5S8	F5S9	F5S10
	BAU	Nat	75%	25%	High	High	Fed	Incr	50%	OffSh	Hard
	Base	RPS	Soft	Soft	Load	Gas	CES	PEV	Hurd	Wind	Limit
ENT	4	4	3	1	8	1	3	2	1	1	2
FRCC	16	10	10	10	20	13	10	11	9	10	10
IESO	5	5	5	5	5	5	5	5	5	5	5
MAPP_CA	2	5	5	5	6	5	5	5	5	5	5
MAPP_US	2	7	7	6	10	4	7	6	8	6	6
MISO_IN	5	20	1	1	4	1	14	1	1	1	1
MISO_MI	3	3	3	3	4	3	8	3	3	3	3
MISO_MO-IL	2	20	8	3	8	6	3	3	4	3	3
MISO_W	9	40	41	7	43	18	3	25	15	21	24
MISO_WUMS	10	13	12	19	32	10	23	17	13	14	14
NE	1	15	17	64	67	66	56	66	72	65	65
NEISO	9	9	9	8	9	9	8	9	8	9	8
NonRTO_Mid	1	1	1	1	4	1	3	2	1	1	1
NYISO_A-F	4	7	4	4	6	4	4	4	4	4	4
NYISO_G-I	1	0	0	0	2	0	0	0	0	0	0
NYISO_J-K	3	2	2	2	4	2	1	2	2	6	2
PJM_E	7	7	7	7	12	7	7	7	7	12	7
PJM_ROM	12	6	6	12	7	12	14	8	12	6	12
PJM_ROR	20	27	27	17	58	17	43	31	17	18	17
SOCO	10	8	8	8	19	9	10	9	8	8	8
SPP_N	3	28	39	30	30	20	1	15	15	11	16
SPP_S	8	43	53	58	62	53	49	55	54	54	54
TVA	8	8	8	8	17	6	14	9	8	8	8
VACAR	20	19	19	19	32	16	24	21	19	20	19
	165	310	294	298	468	288	315	316	291	292	294

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Future 5 Results (cont.)

- EI new CC builds through 2030 are shown below by NEEM region for Future 5.
 - F5S10 Hard Limits moves some wind from SPP_N to MISO_W relative to F5S2 (25%).
 - F5S8 50% Hurdles moves some wind to Nebraska relative to F5S10 Hard Limit.

2030 EI New CC and On-Shore Wind Builds by Region: BAU vs. Future 5 (GW)

	Cum New CCs in 2030											Cum New On-Sh Wind in 2030										
	F1S3	F5B	F5S1	F5S2	F5S3	F5S4	F5S5	F5S7	F5S8	F5S9	F5S10	F1S3	F5B	F5S1	F5S2	F5S3	F5S4	F5S5	F5S7	F5S8	F5S9	F5S10
	BAU	Nat	75%	25%	High	High	Fed	Incr	50%	OffSh	Hard	BAU	Nat	75%	25%	High	High	Fed	Incr	50%	OffSh	Hard
	Base	RPS	Soft	Soft	Load	Gas	CES	PHV	Hurd	Wind	Limit	Base	RPS	Soft	Soft	Load	Gas	CES	PHV	Hurd	Wind	Limit
ENT	3	0	0	0	2	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
FRCC	13	7	7	7	17	5	3	8	6	7	7	0	0	0	0	0	0	0	0	0	0	0
IESO	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2
MAPP_CA	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MAPP_US	0	0	0	0	0	0	0	0	0	0	0	1	7	7	6	10	4	6	6	7	6	6
MISO_IN	4	0	0	0	3	0	13	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0
MISO_MI	0	0	0	0	0	0	3	0	0	0	0	3	3	2	2	3	3	2	3	2	2	2
MISO_MO-IL	0	0	0	0	0	0	0	0	0	0	0	0	18	6	0	6	3	0	1	2	0	0
MISO_W	0	0	0	0	0	0	0	0	0	0	0	9	40	41	7	42	18	3	25	15	21	24
MISO_WUMS	4	0	0	0	3	0	4	0	0	0	0	1	5	1	1	1	1	1	1	1	1	1
NE	0	0	0	0	0	0	0	0	0	0	0	0	15	16	64	67	65	56	65	72	65	65
NEISO	2	2	2	2	2	2	2	2	2	2	2	5	5	5	4	5	5	5	5	4	0	4
NonRTO_Mid	1	0	0	0	2	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NYISO_A-F	1	1	1	1	1	1	1	1	1	1	1	4	6	3	3	5	3	3	3	3	3	3
NYISO_G-I	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NYISO_J-K	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
PJM_E	5	5	5	5	5	5	5	5	5	5	5	1	1	1	1	1	1	1	1	1	1	1
PJM_ROM	2	2	2	2	2	2	4	2	2	2	2	7	1	1	7	1	7	7	2	7	1	7
PJM_ROR	8	3	3	3	15	3	29	3	3	3	3	9	20	20	10	31	10	10	20	10	9	10
SOCO	8	5	5	5	16	5	8	6	5	5	5	0	0	0	0	0	0	0	0	0	0	0
SPP_N	2	0	0	0	0	0	0	0	0	0	0	0	28	38	29	27	19	0	14	14	11	15
SPP_S	2	0	0	0	0	0	0	0	0	0	0	3	41	51	56	60	51	44	53	53	52	53
TVA	4	2	4	4	10	1	4	4	2	4	4	0	0	0	0	0	0	0	0	0	0	0
VACAR	11	10	9	9	19	4	9	9	8	9	9	4	4	4	4	4	4	4	4	4	4	4
	75	39	40	40	102	31	88	43	35	40	40	49	218	201	197	265	197	144	206	198	178	198

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Future 6 (National RPS – Regional Impl.) Base/Soft Constraint Case Results

- Total EI capacity in 2030 is shown below by type for Future 6 in comparison to prior Futures.
 - Comparing F6B to F5B, on-shore wind is replaced with off-shore wind and other renewables.
 - In F6S1, the overall builds do not change significantly from F6B (like F3S1 v. F3B) as transfer limit expansion between super-regions is not permitted in F3 and F6.

Installed 2030 EI Capacity by Type: Future 6 vs. Future 5 and other Futures

	Total 2010	Installed Capacity in 2030									
		F1S3	F2B	F2S11	F3B	F3S12	F4B	F5B	F5S2	F6B	F6S1
		BAU Base	Fed CO2	Hard Limit	Reg CO2	Hard Limit	Aggr EE/DR	Nat RPS	25% Soft	Reg RPS	25% Soft
Coal	272	199	29	31	40	39	172	177	174	178	176
Nuclear	100	105	133	131	134	134	105	105	105	105	105
CC	133	202	246	226	256	252	138	167	167	157	159
CT	120	132	106	112	104	105	69	136	143	134	134
Steam Oil/Gas	75	36	22	29	18	18	3	38	39	38	38
Hydro	45	45	50	51	52	52	45	52	51	52	52
On-Shore Wind	19	68	282	317	199	197	54	236	216	160	159
Off-Shore Wind	0	2	2	2	2	2	2	2	2	39	39
Other Renewable	4	14	13	13	13	13	12	13	13	37	37
New HQ/Maritimes	0	0	0	3	0	5	0	0	6	0	1
Other	17	17	17	17	17	17	17	17	17	17	17
Total w/o DR	783	819	901	932	833	833	617	942	933	916	917
DR	33	71	71	71	71	71	152	71	71	71	71
Total w/DR	816	890	971	1003	904	903	769	1013	1004	987	987
EI Demand 2030 (TWh)		3702	3248	3248	3248	3248	3008	3609	3609	3609	3609
Change from F1S3			-12%	-12%	-12%	-12%	-19%	-3%	-3%	-3%	-3%

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Future 6 Base/Soft Constraint Case Results

- EI capacity in 2030 is shown below by region for Future 6 in comparison to Future 5.
 - *In F6B relative to F5B, on-shore wind decreases in MISO and SPP and increases in PJM_ROR.*
 - *In F6S1 relative to F6B, wind builds move from SPP_N to SPP_S and NE.*

2030 EI Capacity by Region: Future 6 vs. Future 5 (GW)

	Cum New Builds in 2030					Cum New CCs in 2030					Cum New On-Sh Wind 2030				
	F1S3	F5B	F5S2	F6B	F6S1	F1S3	F5B	F5S2	F6B	F6S1	F1S3	F5B	F5S2	F6B	F6S1
	BAU	Nat	25%	Reg	25%	BAU	Nat	25%	Reg	25%	BAU	Nat	25%	Reg	25%
	Base	RPS	Soft	RPS	Soft	Base	RPS	Soft	RPS	Soft	Base	RPS	Soft	RPS	Soft
ENT	4	4	1	2	2	3	0	0	1	1	0	2	0	0	0
FRCC	16	10	10	9	9	13	7	7	4	4	0	0	0	0	0
IESO	5	5	5	5	5	1	1	1	1	1	2	2	2	2	2
MAPP_CA	2	5	5	5	5	2	0	0	0	0	0	0	0	0	0
MAPP_US	2	7	6	8	8	0	0	0	0	0	1	7	6	7	7
MISO_IN	5	20	1	1	1	4	0	0	0	0	0	19	0	0	0
MISO_MI	3	3	3	3	3	0	0	0	0	0	3	3	2	2	2
MISO_MO-IL	2	20	3	3	3	0	0	0	0	0	0	18	0	0	0
MISO_W	9	40	7	17	17	0	0	0	0	0	9	40	7	17	17
MISO_WUMS	10	13	19	14	14	4	0	0	0	2	1	5	1	1	1
NE	1	15	64	1	1	0	0	0	0	0	0	15	64	0	3
NEISO	9	9	8	9	9	2	2	2	2	2	5	5	4	5	5
NonRTO_Mid	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
NYISO_A-F	4	7	4	4	4	1	1	1	1	1	4	6	3	3	3
NYISO_G-I	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
NYISO_J-K	3	2	2	3	3	1	1	1	1	1	0	0	0	0	0
PJM_E	7	7	7	16	16	5	5	5	5	5	1	1	1	1	1
PJM_ROM	12	6	12	14	14	2	2	2	2	2	7	1	7	7	7
PJM_ROR	20	27	17	61	61	8	3	3	3	3	9	20	10	54	54
SOCO	10	8	8	14	14	8	5	5	5	5	0	0	0	0	0
SPP_N	3	28	30	14	14	2	0	0	0	0	0	28	29	13	4
SPP_S	8	43	58	26	26	2	0	0	0	0	3	41	56	24	30
TVA	8	8	8	10	10	4	2	4	1	1	0	0	0	0	0
VACAR	20	19	19	48	48	11	10	9	3	3	4	4	4	4	4
	165	310	298	287	287	75	39	40	30	31	49	218	197	141	141

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Future 7 and 8 Results

- Future 7B (Nuclear Resurgence) was equilibrated with MRN, but changes to electricity demand and gas prices relative to the BAU are relatively small.
- Future 8B (Combined Federal Climate and Energy Policy) was equilibrated with MRN, with electricity demand then replaced with the electricity demand (and DR) specified in F4B.
 - *The carbon prices and gas prices in F8B are nearly identical to those in F2B, as the added RPS in Future 8 is not binding given the amount of wind built in response to carbon prices.*

EI Electricity Demand (TWh)

	2015	2020	2025	2030	2035	2040
BAU (F1S3)	3,317	3,446	3,572	3,702	3,838	3,979
Future 7 Base (F5B)	3,307	3,444	3,576	3,700	3,835	3,964
Future 8 Base (F8B)	3,159	3,115	3,058	3,008	2,962	2,918

Gas Prices (2010 \$/mmBtu Henry Hub)

	2015	2020	2025	2030	2035	2040
BAU (F1S3)	4.84	5.22	6.07	6.56	7.25	8.02
Future 7 Base (F7B)	4.82	5.10	5.88	6.40	7.05	7.81
Future 8 Base (F8B)	6.26	6.73	7.27	4.90	4.54	4.99

Future 7 and 8 Results (cont.)

- Total EI capacity in 2030 by type is shown below by for Futures 7 and 8.
 - In F7B, relative to the BAU, the additional nuclear power largely replaces CCs. As in the BAU, the F7S1 soft constraint run does not materially change the F7B builds.*
 - In F8B, lower demand and higher DR reduce the CC and wind builds relative to F2.*

Installed 2030 EI Capacity by Type: Futures 7 and 8 vs. prior Futures (GW)

	Installed Capacity in 2030															
	F1S3	F2B	F2S11	F3B	F3S12	F4B	F5B	F5S2	F6B	F6S1	F7B	F7S1	F8B	F8S1	F8S2	
	Total 2010	BAU Base	Fed CO2	Hard Limit	Reg CO2	Hard Limit	Aggr EE/DR	Nat RPS	25% Soft	Reg RPS	25% Soft	Nuk Res	25% CO2+	75% RPS	25% Soft	
Coal	272	199	29	31	40	39	172	177	174	178	176	199	197	17	17	18
Nuclear	100	105	133	131	134	134	105	105	105	105	105	129	129	137	135	133
CC	133	202	246	226	256	252	138	167	167	157	159	174	172	210	199	186
CT	120	132	106	112	104	105	69	136	143	134	134	134	137	61	64	71
Steam Oil/Gas	75	36	22	29	18	18	3	38	39	38	38	34	35	9	4	4
Hydro	45	45	50	51	52	52	45	52	51	52	52	47	47	49	49	52
On-Shore Wind	19	68	282	317	199	197	54	236	216	160	159	68	68	245	263	287
Off-Shore Wind	0	2	2	2	2	2	2	2	2	39	39	2	2	2	2	2
Other Renewable	4	14	13	13	13	13	12	13	13	37	37	14	14	12	12	13
New HQ/Maritimes	0	0	0	3	0	5	0	0	6	0	1	0	0	0	0	3
Other	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
Total w/o DR	783	819	901	932	833	833	617	942	933	916	917	818	818	759	762	786
DR	33	71	71	71	71	71	152	71	71	71	71	71	71	152	152	152
Total w/DR	816	890	971	1003	904	903	769	1013	1004	987	987	889	889	912	915	938
EI Demand 2030 (TWh)		3702	3248	3248	3248	3248	3008	3609	3609	3609	3609	3700	3700	3008	3008	3008
Change from F1S3			-12%	-12%	-12%	-12%	-19%	-3%	-3%	-3%	-3%	0%	0%	-19%	-19%	-19%

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Future 7 and 8 Results (cont.)

- EI new capacity builds through 2030 are shown below by region for Futures 7 and 8 vs. the BAU.
 - *In F7S1 relative to F7B, changes are small regionally.*
 - *In F8S1 and F8S2 relative to F8B, more wind is constructed in MISO_W and SPP as transfer limits are relaxed.*

2030 EI Capacity by Region: Futures 7 and 8 vs. BAU (GW)

	Cum New Builds in 2030						Cum New CCs in 2030						Cum New On-Sh Wind 2030					
	F1S3	F7B	F7S1	F8B	F8S1	F8S2	F1S3	F7B	F7S1	F8B	F8S1	F8S2	F1S3	F7B	F7S1	F8B	F8S1	F8S2
	BAU	Nuk	25%	CO2+	75%	25%	BAU	Nuk	25%	CO2+	75%	25%	BAU	Nuk	25%	CO2+	75%	25%
	Base	Res	Soft	RPS	Soft	Soft	Base	Res	Soft	RPS	Soft	Soft	Base	Res	Soft	RPS	Soft	Soft
ENT	4	3	3	7	5	3	3	2	2	6	4	2	0	0	0	0	0	0
FRCC	16	14	14	31	31	31	13	7	6	11	10	10	0	0	0	0	0	0
IESO	5	6	6	5	5	5	1	1	1	1	1	1	2	2	2	2	2	2
MAPP_CA	2	3	3	3	3	5	2	0	0	1	1	1	0	0	0	0	0	0
MAPP_US	2	2	2	6	10	12	0	0	0	0	0	0	1	1	1	6	10	11
MISO_IN	5	2	1	55	47	12	4	1	0	15	17	11	0	0	0	39	29	0
MISO_MI	3	4	4	6	3	2	0	0	0	3	1	0	3	3	3	3	3	2
MISO_MO-IL	2	3	3	28	8	8	0	0	0	0	0	0	0	0	0	26	6	6
MISO_W	9	9	9	27	61	96	0	0	0	0	0	0	9	9	9	27	61	96
MISO_WUMS	10	10	12	15	8	12	4	2	3	4	5	10	1	1	1	9	1	1
NE	1	1	3	13	15	18	0	0	0	0	0	0	0	0	2	12	15	18
NEISO	9	9	9	9	9	9	2	2	2	2	2	2	5	5	5	5	5	5
NonRTO_Mid	1	1	1	5	5	5	1	1	1	4	5	4	0	0	0	0	0	0
NYISO_A-F	4	5	4	6	7	4	1	1	1	1	1	1	4	4	3	5	6	3
NYISO_G-I	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
NYISO_J-K	3	3	4	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
PJM_E	7	8	9	7	7	7	5	5	5	5	5	5	1	1	1	1	1	1
PJM_ROM	12	14	15	6	6	7	2	2	2	2	2	2	7	6	7	1	1	1
PJM_ROR	20	20	19	55	37	25	8	4	3	26	21	13	9	9	9	26	13	9
SOCO	10	11	11	22	21	15	8	9	9	10	10	10	0	0	0	0	0	0
SPP_N	3	2	1	27	42	67	2	1	0	0	0	0	0	0	0	26	41	66
SPP_S	8	8	7	35	47	45	2	2	3	0	0	0	3	5	3	33	46	43
TVA	8	9	9	8	8	8	4	3	2	6	6	4	0	0	0	0	0	0
VACAR	20	19	19	25	23	22	11	5	4	12	11	9	4	4	4	4	4	4
	165	169	170	404	411	421	75	47	45	109	101	86	49	49	49	226	244	268

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Futures 7 and 8 Results (cont.)

- F7B has more generation from nuclear and less from CCs than the BAU. F8B is similar to F2B.
- In comparison to F5B, F6B has more generation from off-shore wind and other renewables (not shown) and less from on-shore wind.

EI Generation as Percent of EI Energy Demand for Six Key Capacity Types

	BAU F1S3		F2B		F3B		F4B		F5B		F6B		F7B		F8B	
	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030
CC	26%	25%	44%	31%	46%	37%	21%	16%	22%	16%	20%	13%	20%	19%	42%	29%
Coal	37%	38%	9%	1%	9%	2%	38%	41%	37%	31%	36%	33%	38%	39%	9%	1%
Nuclear	24%	22%	26%	32%	26%	32%	27%	27%	24%	23%	24%	23%	29%	27%	27%	35%
On-Shore Wind	4%	5%	12%	25%	10%	18%	5%	5%	7%	20%	7%	13%	4%	5%	13%	24%
Off-Shore Wind	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	4%	0%	0%	0%	0%
Hydro	6%	5%	6%	7%	6%	7%	6%	7%	6%	7%	6%	6%	6%	6%	7%	7%
Total	97%	96%	97%	97%	97%	96%	97%	96%	97%	96%	94%	92%	97%	96%	97%	96%

- F7B has somewhat lower U.S. electric sector CO₂ emissions than the BAU. F8B is somewhat lower than F2B.

U.S. Electric Sector CO₂ Emissions (*Millions of metric tons*)

	2020	2025	2030	2035
F1S3 (BAU)	2,041	2,159	2,239	2,424
F2B	1,086	718	487	277
F3B	1,105	747	556	320
F4B	1,858	1,838	1,823	1,883
F5B	1,976	1,874	1,769	1,960
F6B	1,940	1,888	1,814	2,008
F7B	2,021	2,105	2,183	2,363
F8B	1,020	655	416	231

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Next Steps

1. Hardened Future 6, 7 and 8 transfer limits are calculated by the MWG to use in the remaining Future 6, 7 and 8 sensitivities.
2. SSC specifies reserved sensitivities.
3. The remaining specified Future 6, 7 and 8 sensitivities are run.
4. The reserved sensitivities are run.