Net-Zero America - michigan state report

2021-03-18

These data underlie graphs and tables presented in the Princeton Net-Zero America study:

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Notes

- These data are all data from the study available at https://netzeroamerica.princeton.edu.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one "no new policies" reference scenario. In this document, state-level results are grouped by scenario. For some scenarios, the study generated national, but not state-level results.
- Within results for a given scenario, data tables are organized into corresponding sections of the full net-zero study (e.g., Pillar 1, Pillar 2, etc.)
- For Pillar 6 (Land sinks), values shown are maximum carbon storage potentials.

Data by category and subcategory

Table 1: *E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		29,341	32,040				
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	0.384	6.16	30.1	79.2	88.5	89.1	89.1
Sales of space heating units - Electric Resistance (%)	1.64	3.48	5.48	9.74	10.5	10.6	10.6
Sales of space heating units - Fossil (%)	2.54	2.36	0.454	0.019	0	0	0
Sales of space heating units - Gas Furnace (%)	95.4	88	64	11.1	1.06	0.368	0.359
Sales of water heating units - Electric Heat Pump (%)	0.161	1.36	14.4	43	48.4	48.8	48.8
Sales of water heating units - Electric Resistance (%)	1.64	4.19	17	45.3	50.6	51	51
Sales of water heating units - Gas Furnace (%)	98.1	94.3	68.5	11.6	0.763	0.01	0
Sales of water heating units - Other (%)	0.093	0.184	0.185	0.186	0.185	0.186	0.186

Table 2: *E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		5.19	5.33	9.38	9.99	8.85	9.24

Table 3: *E+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	316	311	299	277	251	231	220
Final energy use - Industry (PJ)	501	510	519	515	526	536	540
Final energy use - Residential (PJ)	562	524	489	423	347	286	245
Final energy use - Transportation (PJ)	808	750	656	541	437	372	341

Table 4: *E+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.71	9.81				
Sales of cooking units - Electric Resistance (%)	35.7	49.4	91.3	99.6	100	100	100
Sales of cooking units - Gas (%)	64.3	50.6	8.66	0.436	0	0	0
Sales of space heating units - Electric Heat Pump (%)	2.17	6.93	32.9	84	93.6	94.2	94.2
Sales of space heating units - Electric Resistance (%)	5.77	9.31	7.39	3.21	2.39	2.33	2.44
Sales of space heating units - Fossil (%)	6.93	12.9	9.76	4.29	3.31	3.24	3.18
Sales of space heating units - Gas (%)	85.1	70.8	50	8.51	0.73	0.191	0.189
Sales of water heating units - Electric Heat Pump (%)	0	0.892	12.3	37.3	42	42.4	42.4
Sales of water heating units - Electric Resistance (%)	13.3	25.8	34.3	53.6	57.3	57.5	57.5
Sales of water heating units - Gas Furnace (%)	86.7	73.2	53.3	9.02	0.593	0.008	0
Sales of water heating units - Other (%)	0.036	0.089	0.089	0.089	0.088	0.088	0.089

Table 5: *E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		1,610	4,124	6,688	10,128	11,025	10,511
Public EV charging plugs - DC Fast (1000 units)	0.242		2.84		12.5		20.2
Public EV charging plugs - L2 (1000 units)	0.857		68.2		300		486
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.62	1.88	1.29	0.413	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.67	14.4	45.3	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.3	78.9	50	17	3.35	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.18	4.37	3.13	1.17	0.284	0.062	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.344	0.209	0.065	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.105	0.101	0.067	0.023	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 6: *E+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0.127	3.76	1.42	3.66	1.59
Capital invested - Solar PV - Constrained (billion $2018)		0.126	0.092	3.16	1.11	4.22	2.15
Capital invested - Wind - Base (billion $2018)		0	10.5	8.15	9.94	0.935	1.1
Capital invested - Wind - Constrained (billion $2018)		0	9.73	1.89	0.139	0.288	4.17
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	79.1	119	158	208	269	339	419
Installed renewables - Solar - Base land use assumptions (MW)	90	90	214	4,208	5,805	10,170	12,184
Installed renewables - Solar - Constrained land use assumptions (MW)	90	90	1,046	2,115	5,783	10,159	14,985
Installed renewables - Wind - Base land use assumptions (MW)	2,562	2,562	10,468	17,038	25,452	26,285	27,329
Installed renewables - Wind - Constrained land use assumptions (MW)	2,562	2,562	9,565	11,360	11,512	11,770	13,718

Table 7: *E+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	155	155	336	6,145	8,467	14,755	17,683
Solar - Constrained land use assumptions (GWh)	155	155	1,549	3,097	8,431	14,731	21,695
Wind - Base land use assumptions (GWh)	9,704	9,704	35,628	56,685	83,224	86,111	89,686
Wind - Constrained land use assumptions (GWh)	9,704	9,704	32,156	38,030	38,556	39,428	46,023

Table 8: *E+ scenario - PILLAR 3: Clean fuels - Bioenergy*

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0	0	0	0	0	999
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	0	0	15,722
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	14
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	2
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

Table 9: *E+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	3.35	6.64	6.84	24.3
Annual - BECCS (MMT)		0	0	0	0	0	17.2
Annual - Cement and lime (MMT)		0	3.24	3.35	6.64	6.84	7.07
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	3.24	6.59	13.2	20.1	44.4
Cumulative - BECCS (MMT)		0	0	0	0	0	17.2
Cumulative - Cement and lime (MMT)		0	3.24	6.59	13.2	20.1	27.1
Cumulative - NGCC (MMT)		0	0	0	0	0	0

Table 10: *E+ scenario - PILLAR 4: CCUS - CO2 pipelines*

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	638	638	751	751	1,890
Cumulative investment - All (million $2018)		0	1,578	1,582	1,692	1,698	2,602
Cumulative investment - Spur (million $2018)		0	202	206	316	322	1,226
Cumulative investment - Trunk (million $2018)		0	1,376	1,376	1,376	1,376	1,376
Spur (km)		0	201	201	314	314	1,452
Trunk (km)		0	437	437	437	437	437

Table 11: *E+ scenario - PILLAR 4: CCUS - CO2 storage*

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million $2020)		0	0	0	0	0	0
Wells and facilities construction costs (million $2020)		0	0	0	0	0	0

Table 12: *E+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-699
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,144
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-148
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,990
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-699
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,176
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-74
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,949
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,649
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							269
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,209
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,392
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							135
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,818

Table 13: *E+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-403
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-35,061
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,106
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,028
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,209
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-7,563
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,511
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,759
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,537
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-202
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,983
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-518
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,236
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-615
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,521
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-529
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-472
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-361
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,529
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-303
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-23,011
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,812
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,632
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-901
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-5,042
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,020
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-708
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,560
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,033

Table 13: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							66
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							421
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,624
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							445
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							144
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,504
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,401
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							33
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							395
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,155
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							223
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							75.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							31.2
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							910
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,845
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							49.5

Table 13: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							408
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,889
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							335
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							46.8
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,833
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,840

Table 14: *E+ scenario - IMPACTS - Fossil fuel industries*

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		747	630	505	380	239	166
Natural gas consumption - Cumulative (tcf)							15,217
Natural gas production - Annual (tcf)		108	102	88.6	74.9	59.4	46.2
Oil consumption - Annual (million bbls)		161	139	108	79	56.3	40.2
Oil consumption - Cumulative (million bbls)							3,351
Oil production - Annual (million bbls)		7.01	7.03	7.02	5.56	4.52	3.01

Table 15: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,017	0.944	0.928	0.795	0.545	0.041
Monetary damages from air pollution - Natural Gas (million 2019$)		287	220	144	131	70.1	29.5
Monetary damages from air pollution - Transportation (million 2019$)		2,671	2,473	1,869	1,078	494	199
Premature deaths from air pollution - Coal (deaths)		115	0.107	0.105	0.09	0.062	0.005
Premature deaths from air pollution - Natural Gas (deaths)		32.4	24.8	16.3	14.8	7.91	3.33
Premature deaths from air pollution - Transportation (deaths)		300	278	210	121	55.5	22.4

Table 16: *E+ scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		775	973	712	420	131	1,058
By economic sector - Construction (jobs)		7,460	10,518	14,669	16,757	15,262	15,653
By economic sector - Manufacturing (jobs)		13,094	15,886	20,840	20,380	16,067	21,000
By economic sector - Mining (jobs)		4,478	3,235	2,220	1,394	828	473

Table 16: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		374	642	1,476	1,637	1,931	1,950
By economic sector - Pipeline (jobs)		908	962	630	487	340	381
By economic sector - Professional (jobs)		4,463	6,055	8,285	9,953	9,303	10,733
By economic sector - Trade (jobs)		3,639	4,031	5,166	5,780	5,505	5,816
By economic sector - Utilities (jobs)		10,590	12,006	14,499	18,070	14,512	15,534
By education level - All sectors - Associates degree or some college (jobs)		14,038	16,886	21,656	24,031	20,580	23,108
By education level - All sectors - Bachelors degree (jobs)		9,884	11,372	14,029	15,264	13,041	14,783
By education level - All sectors - Doctoral degree (jobs)		294	352	442	495	445	502
By education level - All sectors - High school diploma or less (jobs)		19,295	23,061	29,100	31,459	26,667	30,660
By education level - All sectors - Masters or professional degree (jobs)		2,271	2,638	3,270	3,629	3,146	3,545
By resource sector - Biomass (jobs)		2,189	2,402	1,676	1,059	505	4,613
By resource sector - CO2 (jobs)		0	1,568	160	270	348	1,462
By resource sector - Coal (jobs)		1,528	195	0	0	0	0
By resource sector - Grid (jobs)		9,805	13,685	21,282	28,444	23,875	26,299
By resource sector - Natural Gas (jobs)		9,760	7,781	6,815	7,236	4,509	3,489
By resource sector - Nuclear (jobs)		2,009	1,739	1,253	586	340	0
By resource sector - Oil (jobs)		8,747	7,126	5,367	3,718	2,557	1,677
By resource sector - Solar (jobs)		5,130	6,140	12,687	11,538	13,013	15,391
By resource sector - Wind (jobs)		6,615	13,673	19,256	22,027	18,733	19,667
Median wages - Annual - All ($2019 per job)		60,837	61,054	61,281	62,652	63,521	63,774
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		7,264	8,694	11,057	12,242	10,464	11,695
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		2,734	3,316	4,218	4,807	4,164	4,505
On-Site or In-Plant Training - Total jobs - None (jobs)		7,426	8,845	11,188	12,178	10,440	11,920
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		369	451	581	656	561	626
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		27,990	33,000	41,453	44,995	38,250	43,851
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,284	11,138	14,181	15,774	13,499	15,020
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,578	3,175	4,087	4,702	4,094	4,408
On-the-Job Training - All sectors - None (jobs)		2,464	2,887	3,632	3,917	3,377	3,830
On-the-Job Training - All sectors - Over 10 years (jobs)		463	557	712	755	643	729
On-the-Job Training - All sectors - Up to 1 year (jobs)		30,993	36,551	45,885	49,730	42,267	48,612
Related work experience - All sectors - 1 to 4 years (jobs)		16,483	19,435	24,414	26,774	22,874	25,883
Related work experience - All sectors - 4 to 10 years (jobs)		10,587	12,551	15,837	17,482	14,946	16,773
Related work experience - All sectors - None (jobs)		6,541	7,768	9,782	10,720	9,135	10,407
Related work experience - All sectors - Over 10 years (jobs)		2,983	3,511	4,423	4,810	4,075	4,623
Related work experience - All sectors - Up to 1 year (jobs)		9,189	11,042	14,041	15,092	12,850	14,912
Wage income - All (million $2019)		2,785	3,316	4,198	4,692	4,058	4,630

Table 17: *E- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		29,338	32,023				
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Sales of space heating units - Electric Heat Pump (%)	0.384	4.93	7.53	16.1	36.4	61.5	76.2
Sales of space heating units - Electric Resistance (%)	1.64	3.4	3.62	4.32	6.01	8.19	9.45
Sales of space heating units - Fossil (%)	2.54	2.74	2.58	1.99	1.1	0.499	0.282
Sales of space heating units - Gas Furnace (%)	95.4	88.9	86.3	77.6	56.5	29.8	14.1
Sales of water heating units - Electric Heat Pump (%)	0.161	0.855	2.27	6.98	18.4	32.9	41.5
Sales of water heating units - Electric Resistance (%)	1.64	3.69	5.06	9.72	21	35.3	43.8
Sales of water heating units - Gas Furnace (%)	98.1	95.3	92.5	83.1	60.4	31.6	14.6
Sales of water heating units - Other (%)	0.093	0.184	0.185	0.186	0.185	0.186	0.186

Table 18: *E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.21	4.23	5.79	5.99	8.36	8.82

Table 19: *E- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	316	311	304	297	288	275	260
Final energy use - Industry (PJ)	501	510	521	522	536	546	548
Final energy use - Residential (PJ)	562	525	498	472	439	392	339
Final energy use - Transportation (PJ)	809	757	687	629	583	530	468

Table 20: *E- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.67	9.61				
Sales of cooking units - Electric Resistance (%)	35.5	37.1	43	58.6	80.3	93.6	98.3
Sales of cooking units - Gas (%)	64.5	62.9	57	41.4	19.7	6.37	1.71
Sales of space heating units - Electric Heat Pump (%)	2.17	5.44	8.25	17.5	39.1	65.5	80.9
Sales of space heating units - Electric Resistance (%)	5.77	9.38	9.14	8.42	6.65	4.54	3.4
Sales of space heating units - Fossil (%)	6.93	13.2	12.9	11.7	9.27	6.38	4.68
Sales of space heating units - Gas (%)	85.1	72	69.7	62.4	45	23.5	11
Sales of water heating units - Electric Heat Pump (%)	0	0.449	1.69	5.81	15.8	28.5	36
Sales of water heating units - Electric Resistance (%)	13.3	25.5	26.2	29.4	37	46.8	52.5
Sales of water heating units - Gas Furnace (%)	86.7	74	72	64.7	47.1	24.6	11.4
Sales of water heating units - Other (%)	0.036	0.089	0.089	0.089	0.089	0.089	0.089

Table 21: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		0	260	547	1,847	5,817	8,473
Public EV charging plugs - DC Fast (1000 units)	0.242		0.872		4.63		13
Public EV charging plugs - L2 (1000 units)	0.857		21		111		311
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.332	0.969	2.74	7.17	15.7	26.3	34
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.64	2.03	2.07	1.65	1.06	0.547	0.234
Vehicle sales - Light-duty - EV (%)	1.8	4.49	11.5	25.2	47.7	71.6	87.4
Vehicle sales - Light-duty - gasoline (%)	92	87.8	80.2	67.5	47	25.3	11.2
Vehicle sales - Light-duty - hybrid (%)	4.33	5.15	5.81	5.32	4.03	2.4	1.17
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.382	0.33	0.254	0.181	0.101	0.047
Vehicle sales - Light-duty - other (%)	0.106	0.11	0.1	0.087	0.063	0.035	0.016
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 22: *E- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-699
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,144
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-148
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,990
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-699
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,176
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-74
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,949
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,649
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							269

Table 22: *E- scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,209
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,392
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							135
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,818

Table 23: *E- scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-403
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-35,061
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,106
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,028
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,209
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-7,563
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,511
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,759
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,537
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-202
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,983
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-518
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,236
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-615
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,521
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-529
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-472
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-361
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,529
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-303

Table 23: *E- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-23,011
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,812
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,632
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-901
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-5,042
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,020
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-708
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,560
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,033
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							66
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							421
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,624
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							445
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							144
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,504
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,401
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							33
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							395
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,155
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							223
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

Table 23: *E- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							75.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							31.2
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							910
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,845
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							49.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							408
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,889
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							335
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							46.8
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,833
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,840

Table 24: *E- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,017	0.944	0.928	0.795	0.545	0.041
Monetary damages from air pollution - Natural Gas (million 2019$)		259	165	71.9	33.4	10.2	6.87
Monetary damages from air pollution - Transportation (million 2019$)		2,716	2,725	2,633	2,356	1,865	1,273
Premature deaths from air pollution - Coal (deaths)		115	0.107	0.105	0.09	0.062	0.005
Premature deaths from air pollution - Natural Gas (deaths)		29.3	18.6	8.12	3.77	1.15	0.776
Premature deaths from air pollution - Transportation (deaths)		306	307	296	265	210	143

Table 25: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		29,341	32,040				
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	0.384	6.16	30.1	79.2	88.5	89.1	89.1
Sales of space heating units - Electric Resistance (%)	1.64	3.48	5.48	9.74	10.5	10.6	10.6
Sales of space heating units - Fossil (%)	2.54	2.36	0.454	0.019	0	0	0
Sales of space heating units - Gas Furnace (%)	95.4	88	64	11.1	1.06	0.368	0.359
Sales of water heating units - Electric Heat Pump (%)	0.161	1.36	14.4	43	48.4	48.8	48.8
Sales of water heating units - Electric Resistance (%)	1.64	4.19	17	45.3	50.6	51	51
Sales of water heating units - Gas Furnace (%)	98.1	94.3	68.5	11.6	0.763	0.01	0
Sales of water heating units - Other (%)	0.093	0.184	0.185	0.186	0.185	0.186	0.186

Table 26: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		5.19	5.33	9.38	9.99	8.85	9.24

Table 27: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	316	311	299	277	251	231	220
Final energy use - Industry (PJ)	501	510	519	515	526	536	540
Final energy use - Residential (PJ)	562	524	489	423	347	286	245
Final energy use - Transportation (PJ)	808	750	656	541	437	372	341

Table 28: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.71	9.81				
Sales of cooking units - Electric Resistance (%)	35.7	49.4	91.3	99.6	100	100	100
Sales of cooking units - Gas (%)	64.3	50.6	8.66	0.436	0	0	0
Sales of space heating units - Electric Heat Pump (%)	2.17	6.93	32.9	84	93.6	94.2	94.2
Sales of space heating units - Electric Resistance (%)	5.77	9.31	7.39	3.21	2.39	2.33	2.44
Sales of space heating units - Fossil (%)	6.93	12.9	9.76	4.29	3.31	3.24	3.18
Sales of space heating units - Gas (%)	85.1	70.8	50	8.51	0.73	0.191	0.189
Sales of water heating units - Electric Heat Pump (%)	0	0.892	12.3	37.3	42	42.4	42.4
Sales of water heating units - Electric Resistance (%)	13.3	25.8	34.3	53.6	57.3	57.5	57.5
Sales of water heating units - Gas Furnace (%)	86.7	73.2	53.3	9.02	0.593	0.008	0
Sales of water heating units - Other (%)	0.036	0.089	0.089	0.089	0.088	0.088	0.089

Table 29: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		1,610	4,124	6,688	10,128	11,025	10,511
Public EV charging plugs - DC Fast (1000 units)	0.242		2.84		12.5		20.2
Public EV charging plugs - L2 (1000 units)	0.857		68.2		300		486
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.62	1.88	1.29	0.413	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.67	14.4	45.3	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.3	78.9	50	17	3.35	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.18	4.37	3.13	1.17	0.284	0.062	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.344	0.209	0.065	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.105	0.101	0.067	0.023	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 30: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		0	2.69	7.27	8.63	37.6	2.37
Capital invested - Wind - Base (billion $2018)		0	14.8	10.1	6.56	1.26	1.91
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Solar - Base land use assumptions (MW)	90	90	2,722	10,440	20,160	65,082	68,074
Installed renewables - Solar - Constrained land use assumptions (MW)	180	428	1,305	18,338	44,775	94,949	109,214
Installed renewables - Wind - Base land use assumptions (MW)	2,562	2,562	13,701	21,814	27,363	28,486	30,287
Installed renewables - Wind - Constrained land use assumptions (MW)	5,123	5,123	21,667	22,790	23,472	24,313	62,233

Table 31: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	155	155	3,984	15,147	29,199	94,231	98,602
Solar - Constrained land use assumptions (GWh)	310	672	1,958	26,565	64,735	137,400	158,179
Wind - Base land use assumptions (GWh)	9,704	9,704	46,048	71,803	89,535	93,442	99,583
Wind - Constrained land use assumptions (GWh)	19,408	19,408	72,440	76,306	78,636	81,297	203,238

Table 32: *E+RE+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-699
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,144
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-148
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,990
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-699
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,176
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-74
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,949
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,649
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							269
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,209
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,392
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							135
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,818

Table 33: *E+RE+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-403
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-35,061
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,106
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,028
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,209
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-7,563

Table 33: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,511
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,759
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,537
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-202
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,983
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-518
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,236
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-615
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,521
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-529
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-472
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-361
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,529
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-303
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-23,011
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,812
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,632
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-901
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-5,042
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,020
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-708
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,560
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,033
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							66
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							421
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,624
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							445

Table 33: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							144
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,504
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,401
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							33
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							395
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,155
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							223
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							75.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							31.2
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							910
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,845
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							49.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							408
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,889
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							335
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							110

Table 33: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							46.8
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,833
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,840

Table 34: *E+RE+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,017	0.944	0.928	0.795	0.545	0.041
Monetary damages from air pollution - Natural Gas (million 2019$)		248	181	104	72.5	24	6.19
Monetary damages from air pollution - Transportation (million 2019$)		2,671	2,473	1,869	1,078	494	199
Premature deaths from air pollution - Coal (deaths)		115	0.107	0.105	0.09	0.062	0.005
Premature deaths from air pollution - Natural Gas (deaths)		28	20.4	11.8	8.18	2.71	0.698
Premature deaths from air pollution - Transportation (deaths)		300	278	210	121	55.5	22.4

Table 35: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		29,341	32,040				
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	0.384	6.16	30.1	79.2	88.5	89.1	89.1
Sales of space heating units - Electric Resistance (%)	1.64	3.48	5.48	9.74	10.5	10.6	10.6
Sales of space heating units - Fossil (%)	2.54	2.36	0.454	0.019	0	0	0
Sales of space heating units - Gas Furnace (%)	95.4	88	64	11.1	1.06	0.368	0.359
Sales of water heating units - Electric Heat Pump (%)	0.161	1.36	14.4	43	48.4	48.8	48.8
Sales of water heating units - Electric Resistance (%)	1.64	4.19	17	45.3	50.6	51	51
Sales of water heating units - Gas Furnace (%)	98.1	94.3	68.5	11.6	0.763	0.01	0
Sales of water heating units - Other (%)	0.093	0.184	0.185	0.186	0.185	0.186	0.186

Table 36: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		5.19	5.33	9.38	9.99	8.85	9.24

Table 37: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	316	311	299	277	251	231	220

Table 37: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	501	510	519	515	526	536	540
Final energy use - Residential (PJ)	562	524	489	423	347	286	245
Final energy use - Transportation (PJ)	808	750	656	541	437	372	341

Table 38: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.71	9.81				
Sales of cooking units - Electric Resistance (%)	35.7	49.4	91.3	99.6	100	100	100
Sales of cooking units - Gas (%)	64.3	50.6	8.66	0.436	0	0	0
Sales of space heating units - Electric Heat Pump (%)	2.17	6.93	32.9	84	93.6	94.2	94.2
Sales of space heating units - Electric Resistance (%)	5.77	9.31	7.39	3.21	2.39	2.33	2.44
Sales of space heating units - Fossil (%)	6.93	12.9	9.76	4.29	3.31	3.24	3.18
Sales of space heating units - Gas (%)	85.1	70.8	50	8.51	0.73	0.191	0.189
Sales of water heating units - Electric Heat Pump (%)	0	0.892	12.3	37.3	42	42.4	42.4
Sales of water heating units - Electric Resistance (%)	13.3	25.8	34.3	53.6	57.3	57.5	57.5
Sales of water heating units - Gas Furnace (%)	86.7	73.2	53.3	9.02	0.593	0.008	0
Sales of water heating units - Other (%)	0.036	0.089	0.089	0.089	0.088	0.088	0.089

Table 39: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		1,610	4,124	6,688	10,128	11,025	10,511
Public EV charging plugs - DC Fast (1000 units)	0.242		2.84		12.5		20.2
Public EV charging plugs - L2 (1000 units)	0.857		68.2		300		486
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.62	1.88	1.29	0.413	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.67	14.4	45.3	81.3	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.3	78.9	50	17	3.35	0.592	0
Vehicle sales - Light-duty - hybrid (%)	4.18	4.37	3.13	1.17	0.284	0.062	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.344	0.209	0.065	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.105	0.101	0.067	0.023	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 40: *E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0.519	0.537	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0.254	0	0.933	0
Capital invested - Wind - Base (billion $2018)		0.555	4.61	0	0.985	0.262	0.194
Capital invested - Wind - Constrained (billion $2018)		0.211	3.64	0.086	0.901	0.436	0.169
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Solar - Base land use assumptions (MW)	90	90	90	90	675	1,316	1,316
Installed renewables - Solar - Constrained land use assumptions (MW)	90	90	90	360	360	1,474	1,474
Installed renewables - Wind - Base land use assumptions (MW)	2,562	2,939	6,402	6,402	7,236	7,469	7,652
Installed renewables - Wind - Constrained land use assumptions (MW)	2,562	2,705	5,436	5,505	6,268	6,657	6,817

Table 41: *E+RE- scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	155	155	155	155	1,006	1,937	1,937
Solar - Constrained land use assumptions (GWh)	155	155	155	549	549	2,170	2,170
Wind - Base land use assumptions (GWh)	9,704	11,014	22,540	22,540	25,227	25,977	26,570
Wind - Constrained land use assumptions (GWh)	9,704	10,194	19,079	19,327	21,853	23,145	23,668

Table 42: *E+RE- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-699
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,144
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-148
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,990
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-699
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,176
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-74
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,949

Table 42: *E+RE- scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,649
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							269
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,209
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,392
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							135
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,818

Table 43: *E+RE- scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-403
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-35,061
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,106
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,028
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,209
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-7,563
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,511
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,759
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,537
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-202
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,983
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-518
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,236
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-615
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,521
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-529

Table 43: *E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-472
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-361
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,529
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-303
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-23,011
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,812
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,632
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-901
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-5,042
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,020
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-708
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,560
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,033
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							66
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							421
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,624
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							445
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							144
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,504
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,401
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							33
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							395

Table 43: *E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,155
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							223
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							75.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							31.2
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							910
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,845
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							49.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							408
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,889
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							335
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							46.8
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,833
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,840

Table 44: *E+RE- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,017	0.944	0.928	0.795	0.545	0.041
Monetary damages from air pollution - Natural Gas (million 2019$)		283	215	271	199	68.7	22.1
Monetary damages from air pollution - Transportation (million 2019$)		2,671	2,473	1,869	1,078	494	199
Premature deaths from air pollution - Coal (deaths)		115	0.107	0.105	0.09	0.062	0.005

Table 44: *E+RE- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Natural Gas (deaths)		31.9	24.2	30.6	22.5	7.76	2.49
Premature deaths from air pollution - Transportation (deaths)		300	278	210	121	55.5	22.4

Table 45: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		29,338	32,023				
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Sales of space heating units - Electric Heat Pump (%)	0.384	4.93	7.53	16.1	36.4	61.5	76.2
Sales of space heating units - Electric Resistance (%)	1.64	3.4	3.62	4.32	6.01	8.19	9.45
Sales of space heating units - Fossil (%)	2.54	2.74	2.58	1.99	1.1	0.499	0.282
Sales of space heating units - Gas Furnace (%)	95.4	88.9	86.3	77.6	56.5	29.8	14.1
Sales of water heating units - Electric Heat Pump (%)	0.161	0.855	2.27	6.98	18.4	32.9	41.5
Sales of water heating units - Electric Resistance (%)	1.64	3.69	5.06	9.72	21	35.3	43.8
Sales of water heating units - Gas Furnace (%)	98.1	95.3	92.5	83.1	60.4	31.6	14.6
Sales of water heating units - Other (%)	0.093	0.184	0.185	0.186	0.185	0.186	0.186

Table 46: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.21	4.23	5.79	5.99	8.36	8.82

Table 47: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	316	311	304	297	288	275	260
Final energy use - Industry (PJ)	501	510	521	522	536	546	548
Final energy use - Residential (PJ)	562	525	498	472	439	392	339
Final energy use - Transportation (PJ)	809	757	687	629	583	530	468

Table 48: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.67	9.61				
Sales of cooking units - Electric Resistance (%)	35.5	37.1	43	58.6	80.3	93.6	98.3
Sales of cooking units - Gas (%)	64.5	62.9	57	41.4	19.7	6.37	1.71
Sales of space heating units - Electric Heat Pump (%)	2.17	5.44	8.25	17.5	39.1	65.5	80.9
Sales of space heating units - Electric Resistance (%)	5.77	9.38	9.14	8.42	6.65	4.54	3.4
Sales of space heating units - Fossil (%)	6.93	13.2	12.9	11.7	9.27	6.38	4.68
Sales of space heating units - Gas (%)	85.1	72	69.7	62.4	45	23.5	11
Sales of water heating units - Electric Heat Pump (%)	0	0.449	1.69	5.81	15.8	28.5	36
Sales of water heating units - Electric Resistance (%)	13.3	25.5	26.2	29.4	37	46.8	52.5

Table 48: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	86.7	74	72	64.7	47.1	24.6	11.4
Sales of water heating units - Other (%)	0.036	0.089	0.089	0.089	0.089	0.089	0.089

Table 49: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		0	260	547	1,847	5,817	8,473
Public EV charging plugs - DC Fast (1000 units)	0.242		0.872		4.63		13
Public EV charging plugs - L2 (1000 units)	0.857		21		111		311
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.332	0.969	2.74	7.17	15.7	26.3	34
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.64	2.03	2.07	1.65	1.06	0.547	0.234
Vehicle sales - Light-duty - EV (%)	1.8	4.49	11.5	25.2	47.7	71.6	87.4
Vehicle sales - Light-duty - gasoline (%)	92	87.8	80.2	67.5	47	25.3	11.2
Vehicle sales - Light-duty - hybrid (%)	4.33	5.15	5.81	5.32	4.03	2.4	1.17
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.382	0.33	0.254	0.181	0.101	0.047
Vehicle sales - Light-duty - other (%)	0.106	0.11	0.1	0.087	0.063	0.035	0.016
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 50: *E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

Table 51: *E-B+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0

Table 52: *E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy*

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0	0	0	0	0	2,362
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	0	0	0	25,514
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0

Table 52: *E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	18
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	8
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

Table 53: *E-B+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	3.35	6.64	6.84	28.4
Annual - BECCS (MMT)		0	0	0	0	0	21.4
Annual - Cement and lime (MMT)		0	3.24	3.35	6.64	6.84	7.07
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	3.24	6.59	13.2	20.1	48.5
Cumulative - BECCS (MMT)		0	0	0	0	0	21.4
Cumulative - Cement and lime (MMT)		0	3.24	6.59	13.2	20.1	27.1
Cumulative - NGCC (MMT)		0	0	0	0	0	0

Table 54: *E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines*

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	638	638	751	751	1,610
Cumulative investment - All (million $2018)		0	1,576	1,580	1,691	2,036	2,844
Cumulative investment - Spur (million $2018)		0	200	204	315	320	1,128
Cumulative investment - Trunk (million $2018)		0	1,376	1,376	1,376	1,716	1,716
Spur (km)		0	201	201	314	314	1,173
Trunk (km)		0	437	437	437	437	437

Table 55: *E-B+ scenario - PILLAR 4: CCUS - CO2 storage*

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million $2020)		0	0	0	0	0	0
Wells and facilities construction costs (million $2020)		0	0	0	0	0	0

Table 56: *E-B+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-809
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,890
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0

Table 56: *E-B+ scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-138
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,837
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-809
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,042
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-69.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,920
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							462
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							6,140
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							9.95
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							39
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							251
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,902
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							462
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,306
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							9.95
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							39
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							126
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,943

Table 57: *E-B+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-403
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-35,061
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,106
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,028
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,209
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-7,563
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,511
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,759
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,537
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-202
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,983
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-518
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,236
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-615
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,521
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-529
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-472
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-361
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,529
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-303
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-23,011
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,812
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,632
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-901
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-5,042
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,020
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-708
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,560
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,033

Table 57: *E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							66
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							421
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,624
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							445
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							144
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,504
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,401
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							33
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							395
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,155
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							223
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							75.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							31.2
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							910
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,845
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							49.5

Table 57: *E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							408
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,889
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							335
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							46.8
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,833
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,840

Table 58: *E-B+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,017	0.944	0.928	0.795	0.545	0.041
Monetary damages from air pollution - Natural Gas (million 2019$)		263	150	88.6	61.6	27.9	9.31
Monetary damages from air pollution - Transportation (million 2019$)		2,716	2,725	2,633	2,356	1,865	1,273
Premature deaths from air pollution - Coal (deaths)		115	0.107	0.105	0.09	0.062	0.005
Premature deaths from air pollution - Natural Gas (deaths)		29.7	16.9	10	6.95	3.15	1.05
Premature deaths from air pollution - Transportation (deaths)		306	307	296	265	210	143

Table 59: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		29,025	30,109				
Sales of cooking units - Electric Resistance (%)	41	44.2	44.3	44.3	44.3	44.4	44.5
Sales of cooking units - Gas (%)	59	55.8	55.7	55.7	55.7	55.6	55.5
Sales of space heating units - Electric Heat Pump (%)	0.384	11.5	43.9	70.8	75.3	75.8	75.8
Sales of space heating units - Electric Resistance (%)	1.64	4.29	8.99	17.2	22.8	23.7	23.8
Sales of space heating units - Fossil (%)	2.54	2.52	1.3	0.232	0.026	0.001	0
Sales of space heating units - Gas Furnace (%)	95.4	81.7	45.8	11.7	1.81	0.444	0.359
Sales of water heating units - Electric Heat Pump (%)	0.161	0.341	0.345	0.344	0.338	0.341	0.34
Sales of water heating units - Electric Resistance (%)	1.64	3.18	3.15	3.16	3.15	3.14	3.14

Table 59: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	98.1	96.3	96.3	96.3	96.3	96.3	96.3
Sales of water heating units - Other (%)	0.093	0.184	0.185	0.186	0.185	0.186	0.186

Table 60: *REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		4.63	4.71	5.78	5.97	5.98	6.15

Table 61: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	316	316	313	306	298	298	306
Final energy use - Industry (PJ)	502	527	542	555	576	598	623
Final energy use - Residential (PJ)	562	526	505	490	480	473	466
Final energy use - Transportation (PJ)	808	759	697	659	657	674	697

Table 62: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.41	7.89				
Sales of cooking units - Electric Resistance (%)	34.9	34.9	34.9	34.9	34.9	34.9	34.9
Sales of cooking units - Gas (%)	65.1	65.1	65.1	65.1	65.1	65.1	65.1
Sales of space heating units - Electric Heat Pump (%)	1.35	8.6	8.97	9.55	9.94	10.2	10.7
Sales of space heating units - Electric Resistance (%)	5.84	9.06	8.98	8.84	8.56	8.18	7.87
Sales of space heating units - Fossil (%)	7.19	12.3	12	11.8	11.8	11.8	11.8
Sales of space heating units - Gas (%)	85.6	70	70	69.8	69.7	69.7	69.7
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	13.3	25.1	24.9	24.9	24.9	24.8	24.8
Sales of water heating units - Gas Furnace (%)	86.7	74.8	75	75	75	75.1	75.1
Sales of water heating units - Other (%)	0.036	0.089	0.089	0.09	0.09	0.09	0.09

Table 63: *REF scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.119	0.138	0.16	0.186	0.216	0.25	0.29
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.63	2.03	2.2	2.04	1.84	1.72	1.63
Vehicle sales - Light-duty - EV (%)	3.32	5.28	6.04	7.4	9.04	10.5	11.7
Vehicle sales - Light-duty - gasoline (%)	90.6	87.1	85.1	83.4	81.3	79.4	77.8
Vehicle sales - Light-duty - hybrid (%)	4.2	5.06	6.2	6.77	7.36	7.97	8.47
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.379	0.35	0.312	0.31	0.311	0.322
Vehicle sales - Light-duty - other (%)	0.105	0.109	0.106	0.106	0.106	0.105	0.108
Vehicle sales - Medium-duty - diesel (%)	65.2	63.5	61.6	59.6	58	56.5	55.2
Vehicle sales - Medium-duty - EV (%)	0.027	0.105	0.329	0.671	0.895	0.973	0.993
Vehicle sales - Medium-duty - gasoline (%)	34	35.5	37	38.5	39.7	40.8	41.7

Table 63: *REF scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen FC (%)	0.175	0.208	0.242	0.285	0.339	0.409	0.487
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

Table 64: *REF scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-403
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-35,061
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,106
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,028
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,209
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-7,563
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,511
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-944
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,759
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-4,537
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-202
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-10,983
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-518
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,236
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-615
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,521
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-529
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-472
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-361
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,529
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-303
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-23,011
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,812
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,632
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-901
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-5,042

Table 64: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,020
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-708
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,560
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,033
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							66
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							421
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,624
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							445
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							144
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							62.4
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							135
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,504
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,401
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							33
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							395
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,155
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							223
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							75.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							31.2
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.4
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							910

Table 64: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,845
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							49.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							408
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,889
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							335
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							110
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							46.8
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							169
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,833
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,840

Table 65: *REF scenario - PILLAR 6: Land sinks - Forests - REF only*

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-36.6		-17.7				-15.8
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-2.06		-3.7				-3.85
Business-as-usual carbon sink - Total (Mt CO2e/y)	-38.7		-21.4				-19.7

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		3,349	2,043	1,582	1,382	1,306	1,244
Monetary damages from air pollution - Natural Gas (million 2019$)		241	267	356	336	306	272
Monetary damages from air pollution - Transportation (million 2019$)		2,712	2,758	2,801	2,856	2,909	2,963
Premature deaths from air pollution - Coal (deaths)		378	231	179	156	148	140
Premature deaths from air pollution - Natural Gas (deaths)		27.2	30.1	40.2	37.9	34.6	30.8
Premature deaths from air pollution - Transportation (deaths)		305	310	315	321	327	333