Net-Zero America - oklahoma state report

2021-03-15

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)		14,173	16,554				
Sales of cooking units - Electric Resistance (%)	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Sales of space heating units - Electric Heat Pump (%)	1.94	26.9	77	91.1	92.3	92.3	92.3
Sales of space heating units - Electric Resistance (%)	2	4.42	4.72	6.04	6.33	6.36	6.38
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	96.1	68.7	18.2	2.83	1.38	1.34	1.33
Sales of water heating units - Electric Heat Pump (%)	0.059	10.7	56.4	66.5	67	67	66.9
Sales of water heating units - Electric Resistance (%)	1.74	8.05	26.9	31.1	31.3	31.3	31.3
Sales of water heating units - Gas Furnace (%)	97.4	79.4	15	0.632	0	0	0
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79

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)		2.97	3.05	4.83	5.11	4.99	5.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	121	122	117	109	103	101	103
Final energy use - Industry (PJ)	310	318	324	323	325	323	330
Final energy use - Residential (PJ)	177	168	153	133	115	105	99.9
Final energy use - Transportation (PJ)	431	405	359	302	250	219	207

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)		3.2	3.89				
Sales of cooking units - Electric Resistance (%)	40.4	53.1	92	99.6	100	100	100
Sales of cooking units - Gas (%)	59.6	46.9	8.02	0.404	0	0	0
Sales of space heating units - Electric Heat Pump (%)	8.53	25.2	76.9	88.5	89	88.9	88.8
Sales of space heating units - Electric Resistance (%)	24.8	26.1	10.9	7.55	7.39	7.53	7.57
Sales of space heating units - Fossil (%)	5.91	8.95	3.48	2.25	2.19	2.17	2.16
Sales of space heating units - Gas (%)	60.7	39.8	8.68	1.75	1.46	1.44	1.43
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.7	72.9	73.4	73.4	73.4
Sales of water heating units - Electric Resistance (%)	30.5	39.9	28.2	25.5	25.4	25.4	25.4
Sales of water heating units - Gas Furnace (%)	68.2	47.2	8.93	0.373	0	0	0
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.2	1.19	1.2	1.2

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)		710	1,819	2,948	4,465	4,860	4,634
Public EV charging plugs - DC Fast (1000 units)	0.326		1.4		6.16		9.97
Public EV charging plugs - L2 (1000 units)	0.301		33.8		148		240
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 (%)	1.67	1.92	1.31	0.419	0.077	0.013	0
Vehicle sales - Light-duty - EV (%)	3.51	13.9	44.5	81	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.6	79.4	50.8	17.3	3.39	0.593	0
Vehicle sales - Light-duty - hybrid (%)	4.02	4.25	3.08	1.16	0.279	0.06	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.347	0.213	0.067	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.107	0.103	0.069	0.024	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	0.019	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	0	1.09	4.46	0.979
Capital invested - Solar PV - Constrained (billion $2018)		1.7	4.96	6.17	5.53	5.51	2.59
Capital invested - Wind - Base (billion $2018)		0	8.18	17.2	16.7	12	1.18
Capital invested - Wind - Constrained (billion $2018)		6.51	7.43	13.6	12.3	8.59	0.321
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)	130	228	333	490	714	1,005	1,384
Installed renewables - Solar - Base land use assumptions (MW)	260	260	260	260	1,486	6,806	8,044
Installed renewables - Solar - Constrained land use assumptions (MW)	250	790	4,975	12,747	20,780	27,721	31,164
Installed renewables - Wind - Base land use assumptions (MW)	11,527	11,527	17,669	31,558	45,685	56,368	57,483
Installed renewables - Wind - Constrained land use assumptions (MW)	11,527	11,868	17,422	28,542	40,274	48,054	48,365

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	19	19	19	19
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)	551	551	551	551	2,764	12,560	14,854
Solar - Constrained land use assumptions (GWh)	531	1,500	9,235	23,604	38,522	51,191	57,598
Wind - Base land use assumptions (GWh)	48,113	48,113	71,210	122,262	173,218	211,315	215,061
Wind - Constrained land use assumptions (GWh)	48,113	49,220	69,807	109,923	151,621	178,536	179,576

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0	0	192	266	412	531
Conversion capital investment - Cumulative 5-yr (million $2018)		0	0	3,342	1,276	2,536	2,177
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	4	7	9	12
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
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	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	1	1	1
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	0	11	12.5	16	18.8
Annual - BECCS (MMT)		0	0	4.26	5.9	9.16	11.8
Annual - Cement and lime (MMT)		0	0	6.71	6.64	6.84	7.07
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	11	23.5	39.5	58.3
Cumulative - BECCS (MMT)		0	0	4.26	10.2	19.3	31.1
Cumulative - Cement and lime (MMT)		0	0	6.71	13.3	20.2	27.3
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	774	1,805	2,123	2,851	3,186
Cumulative investment - All (million $2018)		0	4,032	6,502	6,684	7,204	7,407
Cumulative investment - Spur (million $2018)		0	0	557	740	1,259	1,462
Cumulative investment - Trunk (million $2018)		0	4,032	5,944	5,944	5,944	5,944
Spur (km)		0	0	670	988	1,715	2,050
Trunk (km)		0	774	1,136	1,136	1,136	1,136

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	1.1	1.76	3.61	6.02	7.46
Injection wells (wells)		0	1	4	8	13	16
Resource characterization, appraisal, permitting costs (million $2020)		103	251	295	295	295	295
Wells and facilities construction costs (million $2020)		0	35.6	139	247	413	513

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)							-18.2
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,525
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-262
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,806
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-18.2
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,381
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-131
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,530
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,283
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							450
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,745
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,254
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							225
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,491

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)							-952
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-477
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221

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)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117

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)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		626	528	423	319	200	139
Natural gas consumption - Cumulative (tcf)							12,746
Natural gas production - Annual (tcf)		3,291	3,111	2,709	2,291	1,817	1,411
Oil consumption - Annual (million bbls)		102	87.7	66.7	45.9	29.6	14.7
Oil consumption - Cumulative (million bbls)							2,028
Oil production - Annual (million bbls)		260	261	261	206	168	112

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		266	0.237	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		238	124	55.4	41.2	23.9	12.8
Monetary damages from air pollution - Transportation (million 2019$)		674	634	485	281	129	50.9
Premature deaths from air pollution - Coal (deaths)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Natural Gas (deaths)		26.9	14	6.25	4.66	2.7	1.44
Premature deaths from air pollution - Transportation (deaths)		75.8	71.3	54.5	31.6	14.5	5.72

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		27.4	55.6	379	447	560	593
By economic sector - Construction (jobs)		14,781	16,934	21,027	22,801	25,208	21,719
By economic sector - Manufacturing (jobs)		28,891	31,436	36,802	33,310	27,008	28,975
By economic sector - Mining (jobs)		35,058	27,735	21,464	14,038	9,029	4,915

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		778	931	1,480	2,080	2,978	2,723
By economic sector - Pipeline (jobs)		1,798	2,040	1,681	1,137	881	643
By economic sector - Professional (jobs)		13,331	13,581	16,852	18,326	19,829	17,485
By economic sector - Trade (jobs)		12,358	11,762	12,564	12,277	12,543	10,597
By economic sector - Utilities (jobs)		11,521	12,676	16,002	17,481	18,831	17,098
By education level - All sectors - Associates degree or some college (jobs)		34,439	34,580	38,498	37,227	36,154	32,760
By education level - All sectors - Bachelors degree (jobs)		29,546	28,272	29,906	27,655	25,933	22,760
By education level - All sectors - Doctoral degree (jobs)		1,008	953	1,026	991	982	839
By education level - All sectors - High school diploma or less (jobs)		46,511	46,674	51,743	49,377	47,418	42,852
By education level - All sectors - Masters or professional degree (jobs)		7,039	6,672	7,078	6,647	6,380	5,537
By resource sector - Biomass (jobs)		118	153	1,079	1,345	2,042	2,533
By resource sector - CO2 (jobs)		53.6	3,571	2,476	756	1,295	1,714
By resource sector - Coal (jobs)		679	47.7	0.976	0.751	0.607	0.518
By resource sector - Grid (jobs)		10,694	12,550	21,365	26,557	30,550	28,842
By resource sector - Natural Gas (jobs)		34,455	26,923	20,616	15,610	10,051	5,609
By resource sector - Nuclear (jobs)		0	0.003	0.006	0	0	0
By resource sector - Oil (jobs)		52,247	47,100	42,254	30,570	22,744	13,938
By resource sector - Solar (jobs)		6,432	7,479	10,834	12,680	15,428	17,569
By resource sector - Wind (jobs)		13,865	19,325	29,626	34,379	34,756	34,543
Median wages - Annual - All ($2019 per job)		59,948	59,892	59,534	59,523	59,782	59,634
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		18,548	18,481	20,312	19,425	18,746	16,770
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		6,931	6,948	7,660	7,491	7,491	6,518
On-Site or In-Plant Training - Total jobs - None (jobs)		19,267	18,984	20,837	19,870	19,094	17,214
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		844	870	991	980	972	878
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		72,954	71,867	78,450	74,131	70,565	63,369
On-the-Job Training - All sectors - 1 to 4 years (jobs)		23,643	23,561	25,912	24,855	24,067	21,520
On-the-Job Training - All sectors - 4 to 10 years (jobs)		6,185	6,278	7,041	7,018	7,145	6,251
On-the-Job Training - All sectors - None (jobs)		6,640	6,434	6,939	6,553	6,296	5,605
On-the-Job Training - All sectors - Over 10 years (jobs)		1,192	1,191	1,305	1,227	1,151	1,052
On-the-Job Training - All sectors - Up to 1 year (jobs)		80,884	79,686	87,054	82,244	78,208	70,320
Related work experience - All sectors - 1 to 4 years (jobs)		44,333	43,558	47,306	44,685	42,664	37,935
Related work experience - All sectors - 4 to 10 years (jobs)		28,132	27,733	30,215	28,703	27,526	24,533
Related work experience - All sectors - None (jobs)		16,125	16,057	17,699	16,947	16,394	14,724
Related work experience - All sectors - Over 10 years (jobs)		8,142	7,971	8,607	8,049	7,545	6,787
Related work experience - All sectors - Up to 1 year (jobs)		21,812	21,831	24,423	23,514	22,739	20,769
Wage income - All (million $2019)		7,107	7,017	7,636	7,256	6,987	6,247

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)		14,157	16,435				
Sales of cooking units - Electric Resistance (%)	30.1	34.2	39	52	70.1	81.2	85
Sales of cooking units - Gas (%)	69.9	65.8	61	48	29.9	18.8	15
Sales of space heating units - Electric Heat Pump (%)	1.94	17.4	23.1	39.7	65.5	83.2	89.8
Sales of space heating units - Electric Resistance (%)	2	4.42	4.46	4.63	5.06	5.73	6.18
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	96.1	78.2	72.4	55.7	29.4	11	3.98
Sales of water heating units - Electric Heat Pump (%)	0.059	1.96	7.15	22.1	45	59.9	65.1
Sales of water heating units - Electric Resistance (%)	1.74	4.42	6.55	12.7	22.2	28.4	30.5
Sales of water heating units - Gas Furnace (%)	97.4	91.9	84.5	63.4	31	9.91	2.58
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79

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)		2.54	2.56	3.09	3.17	4.7	4.96

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	121	122	121	120	117	113	111
Final energy use - Industry (PJ)	310	319	325	326	330	327	334
Final energy use - Residential (PJ)	177	169	164	158	146	131	118
Final energy use - Transportation (PJ)	431	408	374	347	327	302	274

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)		3.16	3.73				
Sales of cooking units - Electric Resistance (%)	40.2	41.8	47.2	61.7	81.7	94.1	98.4
Sales of cooking units - Gas (%)	59.8	58.2	52.8	38.3	18.3	5.9	1.59
Sales of space heating units - Electric Heat Pump (%)	8.53	15.3	21.1	38.1	64.1	81	86.8
Sales of space heating units - Electric Resistance (%)	24.8	29	27.1	22.1	14.5	9.75	8.07
Sales of space heating units - Fossil (%)	5.91	10	9.47	7.6	4.79	3.01	2.4
Sales of space heating units - Gas (%)	60.7	45.8	42.3	32.2	16.6	6.26	2.7
Sales of water heating units - Electric Heat Pump (%)	0	2	7.69	24.1	49.2	65.6	71.4
Sales of water heating units - Electric Resistance (%)	30.5	42.2	40.8	37	31.1	27.3	25.9
Sales of water heating units - Gas Furnace (%)	68.2	54.6	50.3	37.7	18.4	5.87	1.53
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.21	1.21	1.21	1.2

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	115	241	815	2,564	3,735
Public EV charging plugs - DC Fast (1000 units)	0.326		0.434		2.29		6.38
Public EV charging plugs - L2 (1000 units)	0.301		10.4		55		154
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 (%)	1.68	2.07	2.08	1.66	1.07	0.553	0.236
Vehicle sales - Light-duty - EV (%)	1.74	4.37	11.2	24.8	47.2	71.3	87.3
Vehicle sales - Light-duty - gasoline (%)	92.2	88.1	80.6	68	47.5	25.7	11.3
Vehicle sales - Light-duty - hybrid (%)	4.16	5	5.65	5.2	3.96	2.37	1.16
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.384	0.333	0.257	0.184	0.103	0.048
Vehicle sales - Light-duty - other (%)	0.108	0.112	0.102	0.09	0.065	0.036	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)							-18.2
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,525
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-262
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,806
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-18.2
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,381
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-131
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,530
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,283
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							450

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)							4,745
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,254
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							225
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,491

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)							-952
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-477
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715

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)							-27,327
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		266	0.237	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		237	105	51.4	27	9.67	7.79
Monetary damages from air pollution - Transportation (million 2019$)		685	696	682	619	496	343
Premature deaths from air pollution - Coal (deaths)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Natural Gas (deaths)		26.7	11.9	5.81	3.05	1.09	0.88
Premature deaths from air pollution - Transportation (deaths)		77	78.2	76.7	69.6	55.8	38.5

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)		14,173	16,554				
Sales of cooking units - Electric Resistance (%)	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Sales of space heating units - Electric Heat Pump (%)	1.94	26.9	77	91.1	92.3	92.3	92.3
Sales of space heating units - Electric Resistance (%)	2	4.42	4.72	6.04	6.33	6.36	6.38
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	96.1	68.7	18.2	2.83	1.38	1.34	1.33
Sales of water heating units - Electric Heat Pump (%)	0.059	10.7	56.4	66.5	67	67	66.9
Sales of water heating units - Electric Resistance (%)	1.74	8.05	26.9	31.1	31.3	31.3	31.3
Sales of water heating units - Gas Furnace (%)	97.4	79.4	15	0.632	0	0	0
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79

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)		2.97	3.05	4.83	5.11	4.99	5.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	121	122	117	109	103	101	103
Final energy use - Industry (PJ)	310	318	324	323	325	323	330
Final energy use - Residential (PJ)	177	168	153	133	115	105	99.9
Final energy use - Transportation (PJ)	431	405	359	302	250	219	207

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)		3.2	3.89				
Sales of cooking units - Electric Resistance (%)	40.4	53.1	92	99.6	100	100	100
Sales of cooking units - Gas (%)	59.6	46.9	8.02	0.404	0	0	0
Sales of space heating units - Electric Heat Pump (%)	8.53	25.2	76.9	88.5	89	88.9	88.8
Sales of space heating units - Electric Resistance (%)	24.8	26.1	10.9	7.55	7.39	7.53	7.57
Sales of space heating units - Fossil (%)	5.91	8.95	3.48	2.25	2.19	2.17	2.16
Sales of space heating units - Gas (%)	60.7	39.8	8.68	1.75	1.46	1.44	1.43
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.7	72.9	73.4	73.4	73.4
Sales of water heating units - Electric Resistance (%)	30.5	39.9	28.2	25.5	25.4	25.4	25.4
Sales of water heating units - Gas Furnace (%)	68.2	47.2	8.93	0.373	0	0	0
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.2	1.19	1.2	1.2

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)		710	1,819	2,948	4,465	4,860	4,634
Public EV charging plugs - DC Fast (1000 units)	0.326		1.4		6.16		9.97
Public EV charging plugs - L2 (1000 units)	0.301		33.8		148		240
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 (%)	1.67	1.92	1.31	0.419	0.077	0.013	0
Vehicle sales - Light-duty - EV (%)	3.51	13.9	44.5	81	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.6	79.4	50.8	17.3	3.39	0.593	0
Vehicle sales - Light-duty - hybrid (%)	4.02	4.25	3.08	1.16	0.279	0.06	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.347	0.213	0.067	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.107	0.103	0.069	0.024	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	0	0.381	4.53	11.1	7.93
Capital invested - Wind - Base (billion $2018)		3.94	9.8	31.2	29.9	33.3	33.7
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)	260	260	260	665	5,772	18,992	29,015
Installed renewables - Solar - Constrained land use assumptions (MW)	520	7,090	26,391	39,463	68,280	125,547	158,037
Installed renewables - Wind - Base land use assumptions (MW)	11,527	14,207	21,569	46,677	71,962	101,680	133,508
Installed renewables - Wind - Constrained land use assumptions (MW)	23,055	28,566	42,074	82,082	121,892	169,561	199,486

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)	551	551	551	1,289	10,675	34,995	53,523
Solar - Constrained land use assumptions (GWh)	1,102	13,197	49,056	73,202	125,988	229,674	288,320
Wind - Base land use assumptions (GWh)	48,113	58,260	85,647	176,825	266,347	369,711	477,993
Wind - Constrained land use assumptions (GWh)	96,225	116,526	165,926	308,604	444,515	600,153	693,679

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)							-18.2
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,525
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-262
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,806
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-18.2
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,381
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-131
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,530
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,283
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							450
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,745
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,254
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							225
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,491

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)							-952
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773

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)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-477
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238

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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9

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)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		266	0.237	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		225	120	35.1	23.8	10.3	6.76
Monetary damages from air pollution - Transportation (million 2019$)		674	634	485	281	129	50.9
Premature deaths from air pollution - Coal (deaths)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Natural Gas (deaths)		25.4	13.6	3.96	2.69	1.16	0.763
Premature deaths from air pollution - Transportation (deaths)		75.8	71.3	54.5	31.6	14.5	5.72

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)		14,173	16,554				
Sales of cooking units - Electric Resistance (%)	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Sales of space heating units - Electric Heat Pump (%)	1.94	26.9	77	91.1	92.3	92.3	92.3
Sales of space heating units - Electric Resistance (%)	2	4.42	4.72	6.04	6.33	6.36	6.38
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	96.1	68.7	18.2	2.83	1.38	1.34	1.33
Sales of water heating units - Electric Heat Pump (%)	0.059	10.7	56.4	66.5	67	67	66.9
Sales of water heating units - Electric Resistance (%)	1.74	8.05	26.9	31.1	31.3	31.3	31.3
Sales of water heating units - Gas Furnace (%)	97.4	79.4	15	0.632	0	0	0
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79

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)		2.97	3.05	4.83	5.11	4.99	5.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	121	122	117	109	103	101	103

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	310	318	324	323	325	323	330
Final energy use - Residential (PJ)	177	168	153	133	115	105	99.9
Final energy use - Transportation (PJ)	431	405	359	302	250	219	207

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)		3.2	3.89				
Sales of cooking units - Electric Resistance (%)	40.4	53.1	92	99.6	100	100	100
Sales of cooking units - Gas (%)	59.6	46.9	8.02	0.404	0	0	0
Sales of space heating units - Electric Heat Pump (%)	8.53	25.2	76.9	88.5	89	88.9	88.8
Sales of space heating units - Electric Resistance (%)	24.8	26.1	10.9	7.55	7.39	7.53	7.57
Sales of space heating units - Fossil (%)	5.91	8.95	3.48	2.25	2.19	2.17	2.16
Sales of space heating units - Gas (%)	60.7	39.8	8.68	1.75	1.46	1.44	1.43
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.7	72.9	73.4	73.4	73.4
Sales of water heating units - Electric Resistance (%)	30.5	39.9	28.2	25.5	25.4	25.4	25.4
Sales of water heating units - Gas Furnace (%)	68.2	47.2	8.93	0.373	0	0	0
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.2	1.19	1.2	1.2

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)		710	1,819	2,948	4,465	4,860	4,634
Public EV charging plugs - DC Fast (1000 units)	0.326		1.4		6.16		9.97
Public EV charging plugs - L2 (1000 units)	0.301		33.8		148		240
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 (%)	1.67	1.92	1.31	0.419	0.077	0.013	0
Vehicle sales - Light-duty - EV (%)	3.51	13.9	44.5	81	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.6	79.4	50.8	17.3	3.39	0.593	0
Vehicle sales - Light-duty - hybrid (%)	4.02	4.25	3.08	1.16	0.279	0.06	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.347	0.213	0.067	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.107	0.103	0.069	0.024	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	0.659	2.65	1.08
Capital invested - Solar PV - Constrained (billion $2018)		4.95	7.13	4.83	5.6	7.78	5.84
Capital invested - Wind - Base (billion $2018)		0	0	7.96	10.5	4.98	0
Capital invested - Wind - Constrained (billion $2018)		0	0.453	7.19	8.53	3.71	0.089
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)	260	260	260	260	1,003	4,164	5,530
Installed renewables - Solar - Constrained land use assumptions (MW)	260	4,592	11,567	16,697	23,008	32,290	39,670
Installed renewables - Wind - Base land use assumptions (MW)	11,527	11,527	11,527	17,941	26,841	31,280	31,280
Installed renewables - Wind - Constrained land use assumptions (MW)	11,527	11,527	11,868	17,664	24,882	28,195	28,278

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)	551	551	551	551	1,884	7,748	10,295
Solar - Constrained land use assumptions (GWh)	551	8,560	21,637	31,206	42,932	59,833	73,465
Wind - Base land use assumptions (GWh)	48,113	48,113	48,113	72,219	105,046	121,255	121,255
Wind - Constrained land use assumptions (GWh)	48,113	48,113	49,220	70,691	96,785	108,692	108,979

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)							-18.2
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,525
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-262
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,806
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-18.2
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,381
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-131
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,530

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)							11.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,283
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							450
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,745
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,254
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							225
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,491

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)							-952
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-477
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482

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)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214

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)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		266	0.237	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		251	114	114	78.9	32.4	14.4
Monetary damages from air pollution - Transportation (million 2019$)		674	634	485	281	129	50.9
Premature deaths from air pollution - Coal (deaths)		30	0.027	0.026	0.021	0.013	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Natural Gas (deaths)		28.4	12.9	12.8	8.91	3.66	1.62
Premature deaths from air pollution - Transportation (deaths)		75.8	71.3	54.5	31.6	14.5	5.72

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)		14,157	16,435				
Sales of cooking units - Electric Resistance (%)	30.1	34.2	39	52	70.1	81.2	85
Sales of cooking units - Gas (%)	69.9	65.8	61	48	29.9	18.8	15
Sales of space heating units - Electric Heat Pump (%)	1.94	17.4	23.1	39.7	65.5	83.2	89.8
Sales of space heating units - Electric Resistance (%)	2	4.42	4.46	4.63	5.06	5.73	6.18
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	96.1	78.2	72.4	55.7	29.4	11	3.98
Sales of water heating units - Electric Heat Pump (%)	0.059	1.96	7.15	22.1	45	59.9	65.1
Sales of water heating units - Electric Resistance (%)	1.74	4.42	6.55	12.7	22.2	28.4	30.5
Sales of water heating units - Gas Furnace (%)	97.4	91.9	84.5	63.4	31	9.91	2.58
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79

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)		2.54	2.56	3.09	3.17	4.7	4.96

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	121	122	121	120	117	113	111
Final energy use - Industry (PJ)	310	319	325	326	330	327	334
Final energy use - Residential (PJ)	177	169	164	158	146	131	118
Final energy use - Transportation (PJ)	431	408	374	347	327	302	274

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)		3.16	3.73				
Sales of cooking units - Electric Resistance (%)	40.2	41.8	47.2	61.7	81.7	94.1	98.4
Sales of cooking units - Gas (%)	59.8	58.2	52.8	38.3	18.3	5.9	1.59
Sales of space heating units - Electric Heat Pump (%)	8.53	15.3	21.1	38.1	64.1	81	86.8
Sales of space heating units - Electric Resistance (%)	24.8	29	27.1	22.1	14.5	9.75	8.07
Sales of space heating units - Fossil (%)	5.91	10	9.47	7.6	4.79	3.01	2.4
Sales of space heating units - Gas (%)	60.7	45.8	42.3	32.2	16.6	6.26	2.7
Sales of water heating units - Electric Heat Pump (%)	0	2	7.69	24.1	49.2	65.6	71.4
Sales of water heating units - Electric Resistance (%)	30.5	42.2	40.8	37	31.1	27.3	25.9

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 (%)	68.2	54.6	50.3	37.7	18.4	5.87	1.53
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.21	1.21	1.21	1.2

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	115	241	815	2,564	3,735
Public EV charging plugs - DC Fast (1000 units)	0.326		0.434		2.29		6.38
Public EV charging plugs - L2 (1000 units)	0.301		10.4		55		154
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 (%)	1.68	2.07	2.08	1.66	1.07	0.553	0.236
Vehicle sales - Light-duty - EV (%)	1.74	4.37	11.2	24.8	47.2	71.3	87.3
Vehicle sales - Light-duty - gasoline (%)	92.2	88.1	80.6	68	47.5	25.7	11.3
Vehicle sales - Light-duty - hybrid (%)	4.16	5	5.65	5.2	3.96	2.37	1.16
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.384	0.333	0.257	0.184	0.103	0.048
Vehicle sales - Light-duty - other (%)	0.108	0.112	0.102	0.09	0.065	0.036	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	0.034	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	2.6	1.6	12.5	21.2	5.44

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	34.2	34.2	34.2	34.2
Biomass w/ccu power plant (GWh)	0	0	2,913	4,709	18,789	42,612	48,723

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0	188	2,532	4,349	6,838	7,232
Conversion capital investment - Cumulative 5-yr (million $2018)		0	2,381	25,955	21,506	29,942	4,994
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1

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	27	39	51	51
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	2	3	14	34	39
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	2	2	2
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	2.89	42.8	69.5	107	113
Annual - BECCS (MMT)		0	2.89	36.1	62.8	99.9	106
Annual - Cement and lime (MMT)		0	0	6.71	6.64	6.84	7.07
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	2.89	45.7	115	222	335
Cumulative - BECCS (MMT)		0	2.89	39	102	202	307
Cumulative - Cement and lime (MMT)		0	0	6.71	13.3	20.2	27.3
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	865	2,722	4,312	5,904	6,156
Cumulative investment - All (million $2018)		0	4,390	8,116	11,940	14,166	14,563
Cumulative investment - Spur (million $2018)		0	69.1	1,512	2,637	4,863	5,259
Cumulative investment - Trunk (million $2018)		0	4,321	6,605	9,304	9,304	9,304
Spur (km)		0	90.7	1,586	2,740	4,332	4,584
Trunk (km)		0	774	1,136	1,572	1,572	1,572

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0.92	4.28	9.51	12.8	13.4
Injection wells (wells)		0	2	9	16	26	33
Resource characterization, appraisal, permitting costs (million $2020)		103	294	380	380	380	380
Wells and facilities construction costs (million $2020)		0	70.4	274	489	817	1,014

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)							-560
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,205
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)							-231
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,996
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-560
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,212
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)							-116
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,887
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							496
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,423
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							183
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							2,300
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							399
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							12,800
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							496
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,008
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							183
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							2,300
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							199
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,186

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)							-952
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-477
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221

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)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117

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)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		266	0.237	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		229	98.6	66.6	42.2	17.9	9.91
Monetary damages from air pollution - Transportation (million 2019$)		685	696	682	619	496	343
Premature deaths from air pollution - Coal (deaths)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Natural Gas (deaths)		25.8	11.1	7.52	4.76	2.02	1.12
Premature deaths from air pollution - Transportation (deaths)		77	78.2	76.7	69.6	55.8	38.5

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)		13,857	14,543				
Sales of cooking units - Electric Resistance (%)	30.1	32.3	32.3	32.3	32.3	32.3	32.3
Sales of cooking units - Gas (%)	69.9	67.7	67.7	67.7	67.7	67.7	67.7
Sales of space heating units - Electric Heat Pump (%)	1.94	29.6	70.8	79.1	79.5	79.5	79.5
Sales of space heating units - Electric Resistance (%)	2	6.3	12.1	15.9	18.7	19.1	19.2
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	96.1	64.1	17.1	5.05	1.83	1.38	1.33
Sales of water heating units - Electric Heat Pump (%)	0.059	0.129	0.128	0.129	0.129	0.127	0.127
Sales of water heating units - Electric Resistance (%)	1.74	3.67	3.65	3.65	3.67	3.67	3.68

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 (%)	97.4	94.4	94.5	94.5	94.4	94.4	94.4
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79

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)		2.84	2.89	4.38	4.61	4.42	4.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	121	123	124	125	127	132	141
Final energy use - Industry (PJ)	310	325	335	340	350	358	369
Final energy use - Residential (PJ)	177	167	164	162	163	166	169
Final energy use - Transportation (PJ)	431	408	377	358	359	370	385

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)		3.09	3.21				
Sales of cooking units - Electric Resistance (%)	39.7	39.7	39.7	39.7	39.7	39.7	39.7
Sales of cooking units - Gas (%)	60.3	60.3	60.3	60.3	60.3	60.3	60.3
Sales of space heating units - Electric Heat Pump (%)	5.79	35.1	36.6	38.9	40.5	42.1	44.4
Sales of space heating units - Electric Resistance (%)	25.8	23.1	22.7	22.1	21.2	19.8	17.5
Sales of space heating units - Fossil (%)	6.03	6.01	6.08	6.04	5.95	5.95	5.96
Sales of space heating units - Gas (%)	62.3	35.7	34.6	33	32.4	32.1	32.2
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	30.5	42.6	42.5	42.6	42.5	42.5	42.4
Sales of water heating units - Gas Furnace (%)	68.2	56.1	56.2	56.2	56.3	56.3	56.4
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.22	1.22	1.22	1.22

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 (%)	1.68	2.07	2.21	2.05	1.85	1.73	1.64
Vehicle sales - Light-duty - EV (%)	3.16	5.08	5.81	7.12	8.7	10.2	11.3
Vehicle sales - Light-duty - gasoline (%)	90.9	87.5	85.5	83.8	81.8	79.9	78.3
Vehicle sales - Light-duty - hybrid (%)	4.04	4.91	6.02	6.6	7.2	7.83	8.37
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.381	0.353	0.315	0.314	0.315	0.326
Vehicle sales - Light-duty - other (%)	0.108	0.111	0.108	0.109	0.108	0.107	0.11
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)							-952
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-477
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182

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)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666

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)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761

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)	-3.92		-9.16				-7.43
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.482		-0.805				-0.847
Business-as-usual carbon sink - Total (Mt CO2e/y)	-4.4		-9.97				-8.27

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,113	545	307	245	215	200
Monetary damages from air pollution - Natural Gas (million 2019$)		242	213	229	166	153	128
Monetary damages from air pollution - Transportation (million 2019$)		685	706	728	753	779	805
Premature deaths from air pollution - Coal (deaths)		126	61.6	34.7	27.6	24.2	22.6
Premature deaths from air pollution - Natural Gas (deaths)		27.4	24	25.8	18.7	17.3	14.5
Premature deaths from air pollution - Transportation (deaths)		77	79.4	81.8	84.7	87.6	90.5