Net-Zero America - south carolina state report

Larson et al. 2020

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These data underlie graphs and tables presented in the Princeton Net-Zero America study (E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, interim report, Princeton University, Princeton, NJ, December 15, 2020. Report available at https://netzeroamerica.princeton.edu.)

Notes

- These data are a subset of 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.)

- Some results are not model outputs, but rather they are limits that apply across all scenarios (e.g., maximum carbon storage potential in agricultural soils).

List of Tables

Table 1: *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)	0	3.83	4.21	0	0	0	0
Sales of cooking units - Electric Resistance (%)	82.7	86.4	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	17.3	13.6	2.33	0.117	0	0	0
Sales of space heating units - Electric Heat Pump (%)	37.5	51.9	80.7	87.2	87.5	87.4	87.4
Sales of space heating units - Electric Resistance (%)	25.8	25.3	10.7	7.34	7.15	7.29	7.33
Sales of space heating units - Fossil (%)	6.1	7.81	4.43	3.7	3.67	3.6	3.59
Sales of space heating units - Gas (%)	30.5	15	4.16	1.77	1.69	1.69	1.68
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.1	75.7	76.2	76.2	76.1
Sales of water heating units - Electric Resistance (%)	67.7	70.5	30.6	21.7	21.3	21.3	21.3
Sales of water heating units - Gas Furnace (%)	28.2	14.7	2.78	0.118	0	0	0
Sales of water heating units - Other (%)	4.1	2.65	2.54	2.53	2.55	2.56	2.57

Table 2: *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	856	2,191	3,557	5,385	5,864	5,589
Public EV charging plugs - DC Fast (1000 units)	0.1	0	1.63	0	7.19	0	11.6
Public EV charging plugs - L2 (1000 units)	0.476	0	39.1	0	173	0	280
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 (%)	1.47	1.74	1.23	0.391	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.18	16	47.7	82.3	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.5	77.1	47.5	16	3.23	0.588	0
Vehicle sales - Light-duty - hybrid (%)	4.68	4.73	3.3	1.22	0.298	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.335	0.197	0.061	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.098	0.094	0.061	0.021	0.004	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 3: *E+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	114	114	111	106	101	100	102
Final energy use - Industry (PJ)	358	374	380	387	398	399	404
Final energy use - Residential (PJ)	158	150	141	129	119	115	113
Final energy use - Transportation (PJ)	463	438	386	323	267	233	218

Table 4: *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)	0	15,755	17,550	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	10.1	27.5	70.6	83.9	85.2	85.2	85.2
Sales of space heating units - Electric Resistance (%)	9.29	8.33	10.3	12.4	12.9	12.8	12.8
Sales of space heating units - Fossil (%)	2.15	3.92	0.743	0.032	0	0	0

Table 4: *E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	78.5	60.3	18.3	3.66	1.98	1.94	1.94
Sales of water heating units - Electric Heat Pump (%)	0.316	10.5	54.5	64.3	64.7	64.8	64.8
Sales of water heating units - Electric Resistance (%)	7.81	11	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	88	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	3.86	4.03	2.99	2.74	2.74	2.73	2.73

Table 5: *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)	0	3.55	3.63	5.67	5.98	4.97	5.12

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	0.01	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	4.36	5.17	0
Capital invested - Offshore Wind - Base (billion $2018)	0	0	0	0	3.68	14.2	0
Capital invested - Offshore Wind - Constrained (billion $2018)	0	0	0	0	4.4	14.7	0
Capital invested - Solar PV - Base (billion $2018)	0	0	35.5	14.2	14.3	9.91	10
Capital invested - Solar PV - Constrained (billion $2018)	0	2.3	37.4	16.2	10.5	9.49	9.42

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	10.4	10.4
Biomass w/ccu power plant (GWh)	0	0	0	0	4,889	10,689	10,689
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	7,713	34,449	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	7,713	34,449	0
Solar - Base land use assumptions (GWh)	3,487	0	58,756	25,393	27,100	19,925	21,386
Solar - Constrained land use assumptions (GWh)	2,906	0	57,355	31,308	21,828	18,611	16,384

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	175	556	808
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	3,995	8,172	4,970
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	4	9
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	4	8	8
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
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	0	0	1.72	9.44	19.9	26.4
Annual - BECCS (MMT)	0	0	0	0	4.67	15.4	21.7
Annual - Cement and lime (MMT)	0	0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)	0	0	0	1.72	1.45	1.11	1.12
Cumulative - All (MMT)	0	0	0	1.72	11.2	31	57.4
Cumulative - BECCS (MMT)	0	0	0	0	4.67	20	41.8
Cumulative - Cement and lime (MMT)	0	0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)	0	0	0	1.72	3.17	4.28	5.4

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)	0	0	0	0	0	0	0
Injection wells (wells)	0	0	0	0	0	2	2
Resource characterization, appraisal, permitting costs (million $2020)	0	3.29	7.9	10.5	10.5	10.5	10.5
Wells and facilities construction costs (million $2020)	0	0	4.11	16	28.5	47.7	59.2

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	178	849	1,457	1,776
Cumulative investment - All (million $2018)	0	0	0	962	1,718	2,258	2,606
Cumulative investment - Spur (million $2018)	0	0	0	11.3	767	1,307	1,655
Cumulative investment - Trunk (million $2018)	0	0	0	951	951	951	951
Spur (km)	0	0	0	18.7	690	1,298	1,616
Trunk (km)	0	0	0	159	159	159	159

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-81.8
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,291
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-38.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,411
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-81.8
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-677
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-19.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-778
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	46.8
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	707
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	70.4
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	824
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	46.8

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

Item	2020	2025	2050
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	371
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	35.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	453

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	36,273
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,646
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	7,310
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	2,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	17,707
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	534
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	813
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	2,422
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,736
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	158
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	12,261
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	274
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,808
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,420
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,902
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	187
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	407
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	183
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	922
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	236
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	24,243
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	960
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,059
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,081
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	11,805

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

Item	2020	2025	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	360
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	610
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,303
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,829
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	51.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	223
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,727
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,028
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	50.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	53.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	68.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	907
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,110
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	25.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	209
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,428
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	514
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	26.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	26.9
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	11.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	549
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	2,791
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	38.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,578
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	774
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	38.7

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	40.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	86.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,105
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	4,876

Table 14: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	271	0.44	0.41	0.325	0.227	0.02
Monetary damages from air pollution - Natural Gas (million 2019$)	0	186	148	88.4	69.9	34.9	12.9
Monetary damages from air pollution - Transportation (million 2019$)	0	1,041	979	750	437	201	79.7
Premature deaths from air pollution - Coal (deaths)	0	30.4	0.049	0.046	0.036	0.025	0.002
Premature deaths from air pollution - Natural Gas (deaths)	0	21	16.7	9.98	7.89	3.95	1.45
Premature deaths from air pollution - Transportation (deaths)	0	117	110	84.4	49.2	22.6	8.97

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	158	182	370	141	433	924	1,074
By economic sector - Construction (jobs)	6,362	5,030	30,329	22,797	26,148	29,404	31,012
By economic sector - Manufacturing (jobs)	5,657	10,125	19,973	20,076	16,400	19,360	15,877
By economic sector - Mining (jobs)	2,531	1,727	1,235	795	478	270	148
By economic sector - Other (jobs)	649	445	5,893	4,191	5,230	5,634	6,866
By economic sector - Pipeline (jobs)	376	367	312	360	238	227	224
By economic sector - Professional (jobs)	3,635	2,923	12,014	9,195	11,480	14,943	16,704
By economic sector - Trade (jobs)	2,865	2,036	8,034	6,165	7,568	9,281	10,722
By economic sector - Utilities (jobs)	8,546	7,557	14,745	16,841	19,130	23,760	22,906
By education level - All sectors - Associates degree or some college (jobs)	9,481	9,440	29,656	25,934	28,119	33,445	33,958
By education level - All sectors - Bachelors degree (jobs)	6,687	6,532	17,905	15,600	16,777	20,227	20,632
By education level - All sectors - Doctoral degree (jobs)	222	191	631	496	574	709	770
By education level - All sectors - High school diploma or less (jobs)	12,795	12,743	40,456	34,878	37,574	44,457	44,997
By education level - All sectors - Masters or professional degree (jobs)	1,595	1,486	4,255	3,653	4,062	4,965	5,175
By resource sector - Biomass (jobs)	655	782	1,020	403	1,304	3,370	4,585
By resource sector - CO2 (jobs)	0	1.58	3.49	961	497	937	1,235
By resource sector - Coal (jobs)	2,325	744	0	0	0	0	0
By resource sector - Grid (jobs)	8,261	7,712	22,626	27,709	34,046	44,991	44,340
By resource sector - Natural Gas (jobs)	3,533	3,626	3,404	2,868	2,985	2,134	1,133
By resource sector - Nuclear (jobs)	3,178	2,635	2,593	2,194	1,214	337	0.097
By resource sector - Oil (jobs)	5,031	4,311	3,403	2,397	1,583	1,006	605
By resource sector - Solar (jobs)	7,792	10,556	59,130	43,470	42,438	39,611	42,263
By resource sector - Wind (jobs)	5.22	26.2	724	559	3,039	11,417	11,371
Median wages - Annual - All ($2019 per job)	55,263	55,437	53,264	54,500	55,316	56,410	57,209
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	4,933	4,840	15,219	13,252	14,384	17,066	17,302
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	1,953	1,751	6,178	5,244	5,909	7,005	7,237
On-Site or In-Plant Training - Total jobs - None (jobs)	5,015	4,995	15,411	13,194	14,222	16,920	17,258

Table 15: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)	245	241	788	694	765	918	934
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	18,634	18,566	55,308	48,178	51,825	61,895	62,801
On-the-Job Training - All sectors - 1 to 4 years (jobs)	6,334	6,189	19,537	17,015	18,509	21,968	22,279
On-the-Job Training - All sectors - 4 to 10 years (jobs)	1,875	1,660	6,155	5,203	5,907	6,992	7,247
On-the-Job Training - All sectors - None (jobs)	1,704	1,643	5,190	4,371	4,740	5,598	5,779
On-the-Job Training - All sectors - Over 10 years (jobs)	302	320	1,011	852	882	1,019	1,016
On-the-Job Training - All sectors - Up to 1 year (jobs)	20,565	20,581	61,011	53,120	57,069	68,227	69,211
Related work experience - All sectors - 1 to 4 years (jobs)	11,177	10,930	32,856	28,580	30,978	36,987	37,633
Related work experience - All sectors - 4 to 10 years (jobs)	7,174	7,034	21,258	18,510	20,042	23,919	24,286
Related work experience - All sectors - None (jobs)	4,360	4,293	13,394	11,637	12,688	15,118	15,432
Related work experience - All sectors - Over 10 years (jobs)	1,963	2,015	5,710	5,048	5,333	6,357	6,361
Related work experience - All sectors - Up to 1 year (jobs)	6,107	6,121	19,686	16,785	18,065	21,422	21,820
Wage income - All (million $2019)	1,701	1,685	4,949	4,391	4,819	5,856	6,038

Table 16: *E+ scenario - IMPACTS - Fossil fuel industries*

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	250	254	214	172	129	81.4	56.4
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	5,174
Natural gas production - Annual (tcf)	0	0	0	0	0	0	0
Oil consumption - Annual (million bbls)	103	97	83.4	63.6	45.3	30.8	19.7
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	1,969
Oil production - Annual (million bbls)	0	0	0	0	0	0	0

Table 17: *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)	0	3.78	4.05	0	0	0	0
Sales of cooking units - Electric Resistance (%)	82.6	83.1	84.7	88.9	94.7	98.3	99.5
Sales of cooking units - Gas (%)	17.4	16.9	15.3	11.1	5.31	1.72	0.462
Sales of space heating units - Electric Heat Pump (%)	37.5	46.3	49.6	59.1	73.7	83	86.3
Sales of space heating units - Electric Resistance (%)	25.8	28.1	26.5	21.5	14	9.4	7.8
Sales of space heating units - Fossil (%)	6.1	8.46	8.09	7	5.31	4.17	3.78
Sales of space heating units - Gas (%)	30.5	17.1	15.8	12.4	7.01	3.39	2.12
Sales of water heating units - Electric Heat Pump (%)	0	2.08	8	25	51.1	68.2	74.1
Sales of water heating units - Electric Resistance (%)	67.7	78.2	73.7	60.5	40.4	27.4	22.9
Sales of water heating units - Gas Furnace (%)	28.2	17	15.7	11.9	5.84	1.86	0.487
Sales of water heating units - Other (%)	4.1	2.66	2.65	2.64	2.62	2.58	2.57

Table 18: *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	0	138	291	982	3,094	4,506
Public EV charging plugs - DC Fast (1000 units)	0.1	0	0.496	0	2.66	0	7.45
Public EV charging plugs - L2 (1000 units)	0.476	0	11.9	0	63.9	0	179
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7

Table 18: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
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 (%)	1.48	1.91	2.04	1.62	1.03	0.528	0.226
Vehicle sales - Light-duty - EV (%)	1.98	4.89	12.3	26.5	49.1	72.5	87.8
Vehicle sales - Light-duty - gasoline (%)	91.5	87.1	79	65.8	45.4	24.4	10.8
Vehicle sales - Light-duty - hybrid (%)	4.86	5.65	6.32	5.71	4.24	2.48	1.19
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.378	0.321	0.244	0.172	0.095	0.044
Vehicle sales - Light-duty - other (%)	0.1	0.103	0.093	0.081	0.058	0.032	0.015
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 19: *E- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	114	115	113	112	109	107	107
Final energy use - Industry (PJ)	358	374	381	391	402	403	407
Final energy use - Residential (PJ)	158	151	147	142	135	128	122
Final energy use - Transportation (PJ)	464	441	404	373	350	323	290

Table 20: *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)	0	15,746	17,554	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	10.1	19.3	24.3	38.5	60.9	76.8	82.9
Sales of space heating units - Electric Resistance (%)	9.29	8.02	8.23	8.98	10.4	11.8	12.5
Sales of space heating units - Fossil (%)	2.15	4.53	4.19	3.17	1.56	0.496	0.13
Sales of space heating units - Gas Furnace (%)	78.5	68.1	63.3	49.4	27.1	10.9	4.44
Sales of water heating units - Electric Heat Pump (%)	0.316	2.04	7.05	21.5	43.6	58	63
Sales of water heating units - Electric Resistance (%)	7.81	7.62	9.51	15.3	24.1	29.8	31.8
Sales of water heating units - Gas Furnace (%)	88	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	3.86	4.23	4.21	3.8	3.27	2.9	2.77

Table 21: *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)	0	2.92	2.93	3.93	4.05	5.12	5.35

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-81.8
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,291
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-38.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,411

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

Item	2020	2025	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-81.8
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-677
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-19.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-778
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	46.8
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	707
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	70.4
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	824
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	46.8
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	371
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	35.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	453

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	36,273
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,646
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	7,310
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	2,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	17,707
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	534
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	813
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	2,422
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,736
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	158
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	12,261
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	274
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,808
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,420

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

Item	2020	2025	2050
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,902
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	187
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	407
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	183
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	922
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	236
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	24,243
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	960
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,059
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,081
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	11,805
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	360
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	610
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,303
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,829
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	51.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	223
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,727
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,028
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	50.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	53.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	68.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	907
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,110
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	25.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	209
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,428
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	514
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	26.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	26.9
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	11.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	549
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	2,791
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	38.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,578
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	774
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	38.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	40.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	86.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,105
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	4,876

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	271	0.44	0.41	0.325	0.227	0.02
Monetary damages from air pollution - Natural Gas (million 2019$)	0	176	116	46.3	17.4	5.7	3.01
Monetary damages from air pollution - Transportation (million 2019$)	0	1,058	1,078	1,057	961	772	534
Premature deaths from air pollution - Coal (deaths)	0	30.4	0.049	0.046	0.036	0.025	0.002
Premature deaths from air pollution - Natural Gas (deaths)	0	19.9	13.1	5.23	1.96	0.644	0.341
Premature deaths from air pollution - Transportation (deaths)	0	119	121	119	108	86.8	60.1

Table 25: *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)	0	3.83	4.21	0	0	0	0
Sales of cooking units - Electric Resistance (%)	82.7	86.4	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	17.3	13.6	2.33	0.117	0	0	0
Sales of space heating units - Electric Heat Pump (%)	37.5	51.9	80.7	87.2	87.5	87.4	87.4
Sales of space heating units - Electric Resistance (%)	25.8	25.3	10.7	7.34	7.15	7.29	7.33
Sales of space heating units - Fossil (%)	6.1	7.81	4.43	3.7	3.67	3.6	3.59
Sales of space heating units - Gas (%)	30.5	15	4.16	1.77	1.69	1.69	1.68
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.1	75.7	76.2	76.2	76.1

Table 25: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	67.7	70.5	30.6	21.7	21.3	21.3	21.3
Sales of water heating units - Gas Furnace (%)	28.2	14.7	2.78	0.118	0	0	0
Sales of water heating units - Other (%)	4.1	2.65	2.54	2.53	2.55	2.56	2.57

Table 26: *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)	0	856	2,191	3,557	5,385	5,864	5,589
Public EV charging plugs - DC Fast (1000 units)	0.1	0	1.63	0	7.19	0	11.6
Public EV charging plugs - L2 (1000 units)	0.476	0	39.1	0	173	0	280
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 (%)	1.47	1.74	1.23	0.391	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.18	16	47.7	82.3	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.5	77.1	47.5	16	3.23	0.588	0
Vehicle sales - Light-duty - hybrid (%)	4.68	4.73	3.3	1.22	0.298	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.335	0.197	0.061	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.098	0.094	0.061	0.021	0.004	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 27: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	114	114	111	106	101	100	102
Final energy use - Industry (PJ)	358	374	380	387	398	399	404
Final energy use - Residential (PJ)	158	150	141	129	119	115	113
Final energy use - Transportation (PJ)	463	438	386	323	267	233	218

Table 28: *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)	0	15,755	17,550	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	10.1	27.5	70.6	83.9	85.2	85.2	85.2
Sales of space heating units - Electric Resistance (%)	9.29	8.33	10.3	12.4	12.9	12.8	12.8
Sales of space heating units - Fossil (%)	2.15	3.92	0.743	0.032	0	0	0
Sales of space heating units - Gas Furnace (%)	78.5	60.3	18.3	3.66	1.98	1.94	1.94
Sales of water heating units - Electric Heat Pump (%)	0.316	10.5	54.5	64.3	64.7	64.8	64.8
Sales of water heating units - Electric Resistance (%)	7.81	11	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	88	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	3.86	4.03	2.99	2.74	2.74	2.73	2.73

Table 29: *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)	0	3.55	3.63	5.67	5.98	4.97	5.12

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion $2018)	0	0	0	15	12.7	8.1	8.19
Capital invested - Solar PV - Base (billion $2018)	0	20.3	23.4	24	11.3	11.7	2.77

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	26,149	26,467	20,830	25,432
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	29,418	29,497	0	46,263
Solar - Base land use assumptions (GWh)	3,487	30,050	38,713	42,841	21,461	23,549	5,869
Solar - Constrained land use assumptions (GWh)	3,487	27,429	40,379	42,211	19,199	17,703	7,418

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-81.8
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,291
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-38.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,411
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-81.8
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-677
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-19.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-778
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	46.8
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	707
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	70.4
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	824
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	46.8
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	371
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	35.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	453

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	36,273
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,646
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	7,310
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	2,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	17,707
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	534
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	813
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	2,422
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,736
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	158
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	12,261
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	274
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,808
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,420
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,902
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	187
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	407
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	183
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	922
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	236
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	24,243
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	960
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,059
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,081
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	11,805
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	360
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	610
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,303
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,829
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	51.5

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

Item	2020	2025	2050
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	223
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,727
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,028
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	50.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	53.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	68.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	907
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,110
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	25.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	209
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,428
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	514
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	26.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	26.9
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	11.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	549
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	2,791
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	38.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,578
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	774
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	38.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	40.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	86.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,105
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	4,876

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	271	0.44	0.41	0.325	0.227	0.02
Monetary damages from air pollution - Natural Gas (million 2019$)	0	181	141	80.4	48.3	12.3	3.77
Monetary damages from air pollution - Transportation (million 2019$)	0	1,041	979	750	437	201	79.7
Premature deaths from air pollution - Coal (deaths)	0	30.4	0.049	0.046	0.036	0.025	0.002
Premature deaths from air pollution - Natural Gas (deaths)	0	20.4	16	9.08	5.46	1.39	0.425
Premature deaths from air pollution - Transportation (deaths)	0	117	110	84.4	49.2	22.6	8.97

Table 35: *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)	0	3.83	4.21	0	0	0	0
Sales of cooking units - Electric Resistance (%)	82.7	86.4	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	17.3	13.6	2.33	0.117	0	0	0
Sales of space heating units - Electric Heat Pump (%)	37.5	51.9	80.7	87.2	87.5	87.4	87.4
Sales of space heating units - Electric Resistance (%)	25.8	25.3	10.7	7.34	7.15	7.29	7.33
Sales of space heating units - Fossil (%)	6.1	7.81	4.43	3.7	3.67	3.6	3.59
Sales of space heating units - Gas (%)	30.5	15	4.16	1.77	1.69	1.69	1.68
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.1	75.7	76.2	76.2	76.1
Sales of water heating units - Electric Resistance (%)	67.7	70.5	30.6	21.7	21.3	21.3	21.3
Sales of water heating units - Gas Furnace (%)	28.2	14.7	2.78	0.118	0	0	0
Sales of water heating units - Other (%)	4.1	2.65	2.54	2.53	2.55	2.56	2.57

Table 36: *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)	0	856	2,191	3,557	5,385	5,864	5,589
Public EV charging plugs - DC Fast (1000 units)	0.1	0	1.63	0	7.19	0	11.6
Public EV charging plugs - L2 (1000 units)	0.476	0	39.1	0	173	0	280
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 (%)	1.47	1.74	1.23	0.391	0.073	0.013	0
Vehicle sales - Light-duty - EV (%)	4.18	16	47.7	82.3	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.5	77.1	47.5	16	3.23	0.588	0
Vehicle sales - Light-duty - hybrid (%)	4.68	4.73	3.3	1.22	0.298	0.066	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.335	0.197	0.061	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.098	0.094	0.061	0.021	0.004	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 37: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	114	114	111	106	101	100	102
Final energy use - Industry (PJ)	358	374	380	387	398	399	404
Final energy use - Residential (PJ)	158	150	141	129	119	115	113
Final energy use - Transportation (PJ)	463	438	386	323	267	233	218

Table 38: *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)	0	15,755	17,550	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	10.1	27.5	70.6	83.9	85.2	85.2	85.2
Sales of space heating units - Electric Resistance (%)	9.29	8.33	10.3	12.4	12.9	12.8	12.8
Sales of space heating units - Fossil (%)	2.15	3.92	0.743	0.032	0	0	0
Sales of space heating units - Gas Furnace (%)	78.5	60.3	18.3	3.66	1.98	1.94	1.94
Sales of water heating units - Electric Heat Pump (%)	0.316	10.5	54.5	64.3	64.7	64.8	64.8
Sales of water heating units - Electric Resistance (%)	7.81	11	28.4	32.3	32.5	32.5	32.5
Sales of water heating units - Gas Furnace (%)	88	74.5	14.1	0.593	0	0	0
Sales of water heating units - Other (%)	3.86	4.03	2.99	2.74	2.74	2.73	2.73

Table 39: *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)	0	3.55	3.63	5.67	5.98	4.97	5.12

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	8.07	8.33	13.7	6.01	7.66	0.596
Capital invested - Solar PV - Constrained (billion $2018)	0	11.2	6.78	16.9	6.15	7.66	0.498

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,487	11,974	13,798	24,602	11,460	15,398	1,271
Solar - Constrained land use assumptions (GWh)	3,487	16,602	11,209	30,264	11,684	15,402	1,059

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-81.8
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,291
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-38.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,411
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-81.8
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-677
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-19.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-778

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

Item	2020	2025	2050
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	46.8
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	707
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	70.4
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	824
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	46.8
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	371
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	35.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	453

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	36,273
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,646
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	7,310
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	2,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	17,707
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	534
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	813
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	2,422
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,736
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	158
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	12,261
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	274
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,808
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,420
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,902
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	187
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	407
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	183

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

Item	2020	2025	2050
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	922
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	236
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	24,243
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	960
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,059
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,081
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	11,805
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	360
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	610
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,303
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,829
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	51.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	223
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,727
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,028
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	50.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	53.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	68.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	907
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,110
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	25.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	209
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,428
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	514
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	26.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	26.9
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	11.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	549

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	2,791
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	38.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,578
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	774
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	38.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	40.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	86.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,105
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	4,876

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	271	0.44	0.41	0.325	0.227	0.02
Monetary damages from air pollution - Natural Gas (million 2019$)	0	202	168	161	123	39.9	12.9
Monetary damages from air pollution - Transportation (million 2019$)	0	1,041	979	750	437	201	79.7
Premature deaths from air pollution - Coal (deaths)	0	30.4	0.049	0.046	0.036	0.025	0.002
Premature deaths from air pollution - Natural Gas (deaths)	0	22.8	18.9	18.1	13.9	4.5	1.45
Premature deaths from air pollution - Transportation (deaths)	0	117	110	84.4	49.2	22.6	8.97

Table 45: *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)	0	3.78	4.05	0	0	0	0
Sales of cooking units - Electric Resistance (%)	82.6	83.1	84.7	88.9	94.7	98.3	99.5
Sales of cooking units - Gas (%)	17.4	16.9	15.3	11.1	5.31	1.72	0.462
Sales of space heating units - Electric Heat Pump (%)	37.5	46.3	49.6	59.1	73.7	83	86.3
Sales of space heating units - Electric Resistance (%)	25.8	28.1	26.5	21.5	14	9.4	7.8
Sales of space heating units - Fossil (%)	6.1	8.46	8.09	7	5.31	4.17	3.78
Sales of space heating units - Gas (%)	30.5	17.1	15.8	12.4	7.01	3.39	2.12
Sales of water heating units - Electric Heat Pump (%)	0	2.08	8	25	51.1	68.2	74.1
Sales of water heating units - Electric Resistance (%)	67.7	78.2	73.7	60.5	40.4	27.4	22.9
Sales of water heating units - Gas Furnace (%)	28.2	17	15.7	11.9	5.84	1.86	0.487
Sales of water heating units - Other (%)	4.1	2.66	2.65	2.64	2.62	2.58	2.57

Table 46: *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	0	138	291	982	3,094	4,506
Public EV charging plugs - DC Fast (1000 units)	0.1	0	0.496	0	2.66	0	7.45
Public EV charging plugs - L2 (1000 units)	0.476	0	11.9	0	63.9	0	179
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 (%)	1.48	1.91	2.04	1.62	1.03	0.528	0.226
Vehicle sales - Light-duty - EV (%)	1.98	4.89	12.3	26.5	49.1	72.5	87.8
Vehicle sales - Light-duty - gasoline (%)	91.5	87.1	79	65.8	45.4	24.4	10.8
Vehicle sales - Light-duty - hybrid (%)	4.86	5.65	6.32	5.71	4.24	2.48	1.19
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.378	0.321	0.244	0.172	0.095	0.044
Vehicle sales - Light-duty - other (%)	0.1	0.103	0.093	0.081	0.058	0.032	0.015
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 47: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	114	115	113	112	109	107	107
Final energy use - Industry (PJ)	358	374	381	391	402	403	407
Final energy use - Residential (PJ)	158	151	147	142	135	128	122
Final energy use - Transportation (PJ)	464	441	404	373	350	323	290

Table 48: *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)	0	15,746	17,554	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	10.1	19.3	24.3	38.5	60.9	76.8	82.9
Sales of space heating units - Electric Resistance (%)	9.29	8.02	8.23	8.98	10.4	11.8	12.5
Sales of space heating units - Fossil (%)	2.15	4.53	4.19	3.17	1.56	0.496	0.13
Sales of space heating units - Gas Furnace (%)	78.5	68.1	63.3	49.4	27.1	10.9	4.44
Sales of water heating units - Electric Heat Pump (%)	0.316	2.04	7.05	21.5	43.6	58	63
Sales of water heating units - Electric Resistance (%)	7.81	7.62	9.51	15.3	24.1	29.8	31.8
Sales of water heating units - Gas Furnace (%)	88	86.1	79.2	59.5	29.1	9.29	2.42
Sales of water heating units - Other (%)	3.86	4.23	4.21	3.8	3.27	2.9	2.77

Table 49: *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)	0	2.92	2.93	3.93	4.05	5.12	5.35

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0.008	0	0.047
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	7.26	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	7.93	7.93	55.2
Biomass w/ccu power plant (GWh)	0	0	0	0	8,149	8,149	8,149

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	463	822	1,376
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	6,674	4,475	6,984
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	5	12
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	2
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	7	7	7
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	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 53: *E-B+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0	0	11.4	17.2	27
Annual - BECCS (MMT)	0	0	0	0	8.07	13.8	23.5
Annual - Cement and lime (MMT)	0	0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	11.4	28.6	55.6
Cumulative - BECCS (MMT)	0	0	0	0	8.07	21.9	45.4
Cumulative - Cement and lime (MMT)	0	0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)	0	0	0	0	0	0	0

Table 54: *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	0
Injection wells (wells)	0	0	0	0	0	2	2
Resource characterization, appraisal, permitting costs (million $2020)	0	3.29	7.9	10.5	10.5	10.5	10.5
Wells and facilities construction costs (million $2020)	0	0	4.11	16	28.5	47.7	59.2

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	159	932	1,177	1,649
Cumulative investment - All (million $2018)	0	0	0	951	1,943	2,149	2,706
Cumulative investment - Spur (million $2018)	0	0	0	0	993	1,199	1,755
Cumulative investment - Trunk (million $2018)	0	0	0	951	951	951	951
Spur (km)	0	0	0	0	773	1,018	1,489
Trunk (km)	0	0	0	159	159	159	159

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-218
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,143
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-33.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,395
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-218
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-600
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-16.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-834
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	132
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,546
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	45.9
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	85.4
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	61.4
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	1,871
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	132
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	328
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	45.9
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	85.4
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	30.7
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	623

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	36,273
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	1,646
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	7,310
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	2,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	17,707
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	534
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	813
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	2,422
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,736
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	158
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	12,261
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	274
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,808
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,420
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	5,902
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	187
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	407
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	183
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	922
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	236
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	24,243
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	960
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,059
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,081
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	11,805
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	360
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	610
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,303
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,829
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	51.5

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

Item	2020	2025	2050
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	223
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,727
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,028
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	50.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	53.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	68.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	907
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,110
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	25.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	209
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,428
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	514
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	26.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	26.9
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	11.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	549
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	2,791
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	38.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	216
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,578
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	774
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	38.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	40.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	86.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,105
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	4,876

Table 58: *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)	0	3.77	3.56	0	0	0	0
Sales of cooking units - Electric Resistance (%)	82.5	82.5	82.5	82.5	82.5	82.5	82.5
Sales of cooking units - Gas (%)	17.5	17.5	17.5	17.5	17.5	17.5	17.5
Sales of space heating units - Electric Heat Pump (%)	36.1	57.9	58.6	59.8	60.9	62.4	64.6
Sales of space heating units - Electric Resistance (%)	26.4	22.4	22.2	21.4	20.5	19.2	16.9
Sales of space heating units - Fossil (%)	6.23	6.42	5.5	5.15	5.08	5.05	5.09
Sales of space heating units - Gas (%)	31.3	13.3	13.7	13.6	13.5	13.4	13.4
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	67.7	79.8	79.8	79.6	79.5	79.5	79.4
Sales of water heating units - Gas Furnace (%)	28.2	17.5	17.5	17.7	17.8	17.8	17.9
Sales of water heating units - Other (%)	4.1	2.67	2.66	2.69	2.72	2.72	2.73

Table 59: *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 (%)	1.47	1.9	2.17	2.02	1.82	1.69	1.61
Vehicle sales - Light-duty - EV (%)	3.82	5.94	6.74	8.31	10.1	11.6	12.8
Vehicle sales - Light-duty - gasoline (%)	89.8	86.2	83.9	82	79.8	77.9	76.4
Vehicle sales - Light-duty - hybrid (%)	4.7	5.53	6.75	7.31	7.86	8.4	8.8
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.374	0.341	0.302	0.298	0.298	0.309
Vehicle sales - Light-duty - other (%)	0.098	0.102	0.099	0.099	0.098	0.097	0.099
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
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 60: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	114	116	117	119	121	125	132
Final energy use - Industry (PJ)	358	383	402	413	428	438	452
Final energy use - Residential (PJ)	158	152	151	152	156	160	165
Final energy use - Transportation (PJ)	463	441	406	385	385	396	410

Table 61: *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)	0	15,522	16,121	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Sales of space heating units - Electric Heat Pump (%)	10.1	29.8	65.1	72	72.3	72.3	72.4
Sales of space heating units - Electric Resistance (%)	9.29	9.59	14.9	20.3	25	25.7	25.7
Sales of space heating units - Fossil (%)	2.15	4.14	2.51	1.22	0.185	0.016	0
Sales of space heating units - Gas Furnace (%)	78.5	56.5	17.5	6.45	2.54	1.99	1.94
Sales of water heating units - Electric Heat Pump (%)	0.316	0.281	0.275	0.277	0.278	0.276	0.277

Table 61: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	7.81	6.92	6.81	6.83	6.85	6.81	6.81
Sales of water heating units - Gas Furnace (%)	88	88.5	88.5	88.6	88.5	88.5	88.5
Sales of water heating units - Other (%)	3.86	4.28	4.39	4.33	4.38	4.4	4.38

Table 62: *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)	0	3.94	4.06	5.79	6.1	5.26	5.44

Table 63: *REF scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-9.71	0	-9.95	-8.06
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-4.82	0	-8.04	-8.46
Business-as-usual carbon sink - Total (Mt CO2e/y)	-14.5	0	-18	-16.5
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	36,273
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	1,646
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	7,310
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	2,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	17,707
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	534
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	813
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	2,422
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	2,736
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	158
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	12,261
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	274
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	2,808
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	1,420
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	5,902
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	187
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	407
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	0	183
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	922
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	236
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	24,243

Table 63: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2050
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	0	960
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	5,059
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	2,081
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	11,805
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	360
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0	610
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	0	1,303
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	1,829
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	51.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	223
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	3,727
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	1,028
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	0	50.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0	53.8
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	0	68.8
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	907
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	6,110
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	25.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	209
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	1,428
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	514
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	0	26.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0	26.9
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	11.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	549
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	2,791
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	38.6
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	216

Table 63: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	0	2,578
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	774
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	0	38.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0	40.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	0	86.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	1,105
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	4,876

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	1,020	676	566	516	495	483
Monetary damages from air pollution - Natural Gas (million 2019$)	0	173	185	202	202	233	244
Monetary damages from air pollution - Transportation (million 2019$)	0	1,057	1,092	1,127	1,167	1,208	1,251
Premature deaths from air pollution - Coal (deaths)	0	114	75.8	63.5	57.8	55.6	54.2
Premature deaths from air pollution - Natural Gas (deaths)	0	19.6	20.9	22.8	22.8	26.3	27.6
Premature deaths from air pollution - Transportation (deaths)	0	119	123	127	131	136	141