Net-Zero America - vermont 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	0.48	0.516	0	0	0	0
Sales of cooking units - Electric Resistance (%)	46.9	58.2	92.8	99.6	100	100	100
Sales of cooking units - Gas (%)	53.1	41.8	7.15	0.36	0	0	0
Sales of space heating units - Electric Heat Pump (%)	3.07	12.1	61.6	90	93.8	94.1	94.1
Sales of space heating units - Electric Resistance (%)	1.43	1.61	1.3	0.591	0.438	0.433	0.475
Sales of space heating units - Fossil (%)	77.8	76.6	30.1	8.25	5.56	5.39	5.36
Sales of space heating units - Gas (%)	17.8	9.73	6.95	1.18	0.152	0.087	0.086
Sales of water heating units - Electric Heat Pump (%)	0	2.16	17	36.8	40.1	40.3	40.3
Sales of water heating units - Electric Resistance (%)	19.3	34	45.2	57.5	59.5	59.7	59.6
Sales of water heating units - Gas Furnace (%)	54.1	47.8	34.7	5.56	0.327	0	0
Sales of water heating units - Other (%)	26.6	16	3.08	0.198	0.072	0.073	0.073

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	118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047	0	0.305	0	1.27	0	2.04
Public EV charging plugs - L2 (1000 units)	0.543	0	7.34	0	30.5	0	49.1
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 (%)	1.66	1.91	1.3	0.418	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.54	14	44.7	81.1	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.5	79.3	50.6	17.2	3.38	0.593	0
Vehicle sales - Light-duty - hybrid (%)	4.06	4.28	3.09	1.16	0.28	0.061	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.346	0.212	0.066	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.107	0.103	0.068	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 3: *E+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	18.9	17.7	16.9	15.8	14.7	13.9	13.5
Final energy use - Industry (PJ)	20.1	20.1	20.5	19.9	19.4	19.3	19.3
Final energy use - Residential (PJ)	33.2	29.9	26.5	22.3	18.3	15.4	13.7
Final energy use - Transportation (PJ)	51.8	48.3	42.1	34.2	27	22.5	20.5

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	1,350	1,474	0	0	0	0
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump (%)	2.16	10.9	39.6	72.4	77.6	77.8	77.9
Sales of space heating units - Electric Resistance (%)	1.2	4.38	16.6	21.3	22	22.2	22.1
Sales of space heating units - Fossil (%)	61.5	32.1	6.16	0.26	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 (%)	35.1	52.6	37.6	6.02	0.358	0	0
Sales of water heating units - Electric Heat Pump (%)	2.07	3.51	16	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	10.3	12.2	23.9	48	52.2	52.5	52.5
Sales of water heating units - Gas Furnace (%)	79.6	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	8.05	4.21	1.92	1.56	1.53	1.54	1.56

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	0.313	0.322	0.616	0.66	0.557	0.583

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	0.03	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)	0	0	0	0	0	1.03	4.22
Capital invested - Solar PV - Constrained (billion $2018)	0	0.025	0.104	0	0	4.36	3.86
Capital invested - Wind - Base (billion $2018)	0	0	2.03	0.534	0.524	0.425	0.362
Capital invested - Wind - Constrained (billion $2018)	0	0	1.39	0.377	0.727	0.135	0.915

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	59.4	59.4	59.4	59.4	59.4
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	60.7	0	0	0	0	1,823	7,865
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	4,415	4,449
Wind - Base land use assumptions (GWh)	604	0	3,243	927	964	822	726
Wind - Constrained land use assumptions (GWh)	604	0	2,204	650	1,310	242	1,804

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0.021	2.53	3.75	4.15	5.03	16.6
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0.036	33.8	27.1	8.69	19	249
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
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	0	0	0	0
Annual - BECCS (MMT)	0	0	0	0	0	0	0
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	0	0
Cumulative - BECCS (MMT)	0	0	0	0	0	0	0
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
Cumulative - NGCC (MMT)	0	0	0	0	0	0	0

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	0	0
Resource characterization, appraisal, permitting costs (million $2020)	0	0	0	0	0	0	0
Wells and facilities construction costs (million $2020)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	0	0	0	0
Cumulative investment - All (million $2018)	0	0	0	0	0	0	0
Cumulative investment - Spur (million $2018)	0	0	0	0	0	0	0
Cumulative investment - Trunk (million $2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	0
Trunk (km)	0	0	0	0	0	0	0

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	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	194
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0

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	92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	102

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	1,021

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	76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	9.65
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	10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	4.83
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	5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.26
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	8.19

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	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	1,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	69.3	0.078	0.077	0.074	0.044	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)	0	17.1	9.51	5.84	5.31	3.26	1.32
Monetary damages from air pollution - Transportation (million 2019$)	0	67	60.3	44.2	24.5	10.5	3.71
Premature deaths from air pollution - Coal (deaths)	0	7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Natural Gas (deaths)	0	1.93	1.07	0.66	0.6	0.368	0.149
Premature deaths from air pollution - Transportation (deaths)	0	7.53	6.78	4.97	2.75	1.19	0.418

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	24.8	28.6	60.2	30.4	25.1	20.5	30.8
By economic sector - Construction (jobs)	1,167	944	992	1,021	1,024	1,747	4,857
By economic sector - Manufacturing (jobs)	427	646	1,155	1,069	1,170	1,656	2,609
By economic sector - Mining (jobs)	359	300	232	167	119	85.5	63
By economic sector - Other (jobs)	181	149	117	134	149	342	1,263
By economic sector - Pipeline (jobs)	41.5	41.9	38.4	33	27.9	23.4	20.4
By economic sector - Professional (jobs)	454	423	587	588	616	957	2,452
By economic sector - Trade (jobs)	428	385	411	406	410	645	1,766
By economic sector - Utilities (jobs)	142	208	570	615	635	1,086	2,760
By education level - All sectors - Associates degree or some college (jobs)	966	939	1,278	1,267	1,312	2,094	5,110
By education level - All sectors - Bachelors degree (jobs)	668	655	872	843	862	1,316	3,086
By education level - All sectors - Doctoral degree (jobs)	25.9	23.8	30.2	29.5	30.2	46.2	116
By education level - All sectors - High school diploma or less (jobs)	1,407	1,353	1,777	1,726	1,768	2,792	6,743
By education level - All sectors - Masters or professional degree (jobs)	158	153	205	200	204	316	766
By resource sector - Biomass (jobs)	103	123	166	86.6	75.6	74.8	132
By resource sector - CO2 (jobs)	0	0	0	0	0	0	0
By resource sector - Grid (jobs)	162	313	1,032	1,134	1,186	2,130	5,566
By resource sector - Natural Gas (jobs)	97.6	95.5	78	60.8	44.7	27.5	18.7
By resource sector - Nuclear (jobs)	0	0	0	0	0	0	0
By resource sector - Oil (jobs)	973	890	760	610	487	395	330
By resource sector - Solar (jobs)	1,771	1,563	1,147	930	1,133	2,665	7,894
By resource sector - Wind (jobs)	119	140	979	1,243	1,251	1,272	1,881
Median wages - Annual - All ($2019 per job)	55,718	56,462	57,614	58,445	59,011	59,507	60,403
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	513	492	659	650	669	1,064	2,594
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	215	196	251	253	258	419	1,074
On-Site or In-Plant Training - Total jobs - None (jobs)	539	520	688	670	690	1,083	2,608

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)	24.8	24	33.3	33.5	34.7	55.9	138
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	1,934	1,892	2,530	2,457	2,524	3,943	9,407
On-the-Job Training - All sectors - 1 to 4 years (jobs)	652	625	839	832	856	1,364	3,335
On-the-Job Training - All sectors - 4 to 10 years (jobs)	209	189	242	246	251	413	1,077
On-the-Job Training - All sectors - None (jobs)	192	182	229	223	228	359	884
On-the-Job Training - All sectors - Over 10 years (jobs)	35.2	33.7	43.3	42.2	43.6	67.9	158
On-the-Job Training - All sectors - Up to 1 year (jobs)	2,136	2,095	2,808	2,722	2,798	4,360	10,366
Related work experience - All sectors - 1 to 4 years (jobs)	1,155	1,120	1,492	1,456	1,494	2,340	5,637
Related work experience - All sectors - 4 to 10 years (jobs)	735	711	953	937	963	1,511	3,633
Related work experience - All sectors - None (jobs)	459	444	591	578	594	942	2,306
Related work experience - All sectors - Over 10 years (jobs)	193	192	263	257	265	411	955
Related work experience - All sectors - Up to 1 year (jobs)	683	658	863	837	861	1,361	3,290
Wage income - All (million $2019)	180	176	240	238	247	391	956

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	10.5	10.6	8.98	7.2	5.42	3.41	2.37
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	217
Natural gas production - Annual (tcf)	0	0	0	0	0	0	0
Oil consumption - Annual (million bbls)	20	20	18.6	16.2	13.9	12.1	10.7
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	496
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	0.481	0.555	0	0	0	0
Sales of cooking units - Electric Resistance (%)	46.7	48.1	52.9	65.8	83.7	94.7	98.6
Sales of cooking units - Gas (%)	53.3	51.9	47.1	34.2	16.3	5.26	1.42
Sales of space heating units - Electric Heat Pump (%)	3.07	2.85	5.68	14	28.4	40.3	45.7
Sales of space heating units - Electric Resistance (%)	1.43	1.62	1.64	1.66	1.46	1.25	1.16
Sales of space heating units - Fossil (%)	77.8	85.6	82.9	75	62.2	52	47.7
Sales of space heating units - Gas (%)	17.8	9.93	9.83	9.3	7.95	6.45	5.52
Sales of water heating units - Electric Heat Pump (%)	0	0.306	1.16	3.82	9.35	15.4	18.6
Sales of water heating units - Electric Resistance (%)	19.3	32.3	32.8	34.8	38.7	42.6	44.7
Sales of water heating units - Gas Furnace (%)	54.1	48.6	48	45.5	39.4	31.5	26.9
Sales of water heating units - Other (%)	26.6	18.8	18	15.8	12.6	10.5	9.75

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	19.7	39.9	136	424	620
Public EV charging plugs - DC Fast (1000 units)	0.047	0	0.104	0	0.478	0	1.31
Public EV charging plugs - L2 (1000 units)	0.543	0	2.49	0	11.5	0	31.4
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 (%)	1.67	2.07	2.08	1.66	1.07	0.552	0.236
Vehicle sales - Light-duty - EV (%)	1.76	4.39	11.3	24.9	47.3	71.3	87.3
Vehicle sales - Light-duty - gasoline (%)	92.2	88	80.5	67.9	47.4	25.6	11.3
Vehicle sales - Light-duty - hybrid (%)	4.2	5.03	5.68	5.22	3.97	2.38	1.16
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.383	0.332	0.256	0.183	0.102	0.047
Vehicle sales - Light-duty - other (%)	0.108	0.111	0.102	0.089	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 19: *E- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	18.9	17.8	17.3	16.8	16.3	15.9	15.6
Final energy use - Industry (PJ)	20.1	20.1	20.7	20.3	20	20	19.8
Final energy use - Residential (PJ)	33.2	30	27.8	25.9	24	22	20
Final energy use - Transportation (PJ)	51.9	48.7	44.2	40.3	37.2	33.7	29.5

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	1,350	1,475	0	0	0	0
Sales of cooking units - Electric Resistance (%)	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Sales of space heating units - Electric Heat Pump (%)	2.16	6.95	8.53	13.3	22.9	32.9	38.2
Sales of space heating units - Electric Resistance (%)	1.2	1.93	2.57	4.61	8	10.5	11.4
Sales of space heating units - Fossil (%)	61.5	37.7	36.8	32.6	25.9	21.5	20.2
Sales of space heating units - Gas Furnace (%)	35.1	53.4	52.1	49.5	43.2	35.1	30.1
Sales of water heating units - Electric Heat Pump (%)	2.07	2.63	3.32	5.68	11.3	18.2	22.2
Sales of water heating units - Electric Resistance (%)	10.3	11.4	11.8	14.3	19.6	26	29.9
Sales of water heating units - Gas Furnace (%)	79.6	81.3	80.5	76	65.6	52.7	44.9
Sales of water heating units - Other (%)	8.05	4.66	4.38	4.02	3.56	3.09	2.97

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	0.233	0.233	0.327	0.339	0.493	0.522

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	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-343

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	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	194
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	102

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.3

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	511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	9.65
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	10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	4.83
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	5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.26
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	8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	1,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	69.3	0.078	0.077	0.074	0.044	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)	0	16.5	7.84	3.09	1.29	0.393	0.341
Monetary damages from air pollution - Transportation (million 2019$)	0	68.1	66.4	62.2	53.8	41.2	27.2
Premature deaths from air pollution - Coal (deaths)	0	7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Natural Gas (deaths)	0	1.87	0.885	0.349	0.146	0.044	0.038
Premature deaths from air pollution - Transportation (deaths)	0	7.66	7.46	6.99	6.05	4.64	3.06

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	0.48	0.516	0	0	0	0
Sales of cooking units - Electric Resistance (%)	46.9	58.2	92.8	99.6	100	100	100
Sales of cooking units - Gas (%)	53.1	41.8	7.15	0.36	0	0	0
Sales of space heating units - Electric Heat Pump (%)	3.07	12.1	61.6	90	93.8	94.1	94.1
Sales of space heating units - Electric Resistance (%)	1.43	1.61	1.3	0.591	0.438	0.433	0.475
Sales of space heating units - Fossil (%)	77.8	76.6	30.1	8.25	5.56	5.39	5.36
Sales of space heating units - Gas (%)	17.8	9.73	6.95	1.18	0.152	0.087	0.086
Sales of water heating units - Electric Heat Pump (%)	0	2.16	17	36.8	40.1	40.3	40.3

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 (%)	19.3	34	45.2	57.5	59.5	59.7	59.6
Sales of water heating units - Gas Furnace (%)	54.1	47.8	34.7	5.56	0.327	0	0
Sales of water heating units - Other (%)	26.6	16	3.08	0.198	0.072	0.073	0.073

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	118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047	0	0.305	0	1.27	0	2.04
Public EV charging plugs - L2 (1000 units)	0.543	0	7.34	0	30.5	0	49.1
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 (%)	1.66	1.91	1.3	0.418	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.54	14	44.7	81.1	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.5	79.3	50.6	17.2	3.38	0.593	0
Vehicle sales - Light-duty - hybrid (%)	4.06	4.28	3.09	1.16	0.28	0.061	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.346	0.212	0.066	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.107	0.103	0.068	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 27: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	18.9	17.7	16.9	15.8	14.7	13.9	13.5
Final energy use - Industry (PJ)	20.1	20.1	20.5	19.9	19.4	19.3	19.3
Final energy use - Residential (PJ)	33.2	29.9	26.5	22.3	18.3	15.4	13.7
Final energy use - Transportation (PJ)	51.8	48.3	42.1	34.2	27	22.5	20.5

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	1,350	1,474	0	0	0	0
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump (%)	2.16	10.9	39.6	72.4	77.6	77.8	77.9
Sales of space heating units - Electric Resistance (%)	1.2	4.38	16.6	21.3	22	22.2	22.1
Sales of space heating units - Fossil (%)	61.5	32.1	6.16	0.26	0	0	0
Sales of space heating units - Gas Furnace (%)	35.1	52.6	37.6	6.02	0.358	0	0
Sales of water heating units - Electric Heat Pump (%)	2.07	3.51	16	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	10.3	12.2	23.9	48	52.2	52.5	52.5
Sales of water heating units - Gas Furnace (%)	79.6	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	8.05	4.21	1.92	1.56	1.53	1.54	1.56

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	0.313	0.322	0.616	0.66	0.557	0.583

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	0	1.64	7.68	8.43
Capital invested - Wind - Base (billion $2018)	0	0	2.03	0.534	0.524	0.425	0.759

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	60.7	0	0	0	2,755	13,409	15,461
Solar - Constrained land use assumptions (GWh)	60.7	0	0	0	5,137	9,828	14,325
Wind - Base land use assumptions (GWh)	604	0	3,243	927	964	822	1,506
Wind - Constrained land use assumptions (GWh)	604	0	2,204	650	1,310	242	1,937

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	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	194
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	102

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	14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	2.34

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	39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	9.65
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	10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	4.83
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	5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.26
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	8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	1,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	69.3	0.078	0.077	0.074	0.044	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)	0	15.7	8.4	4.38	3.21	1.12	0.31
Monetary damages from air pollution - Transportation (million 2019$)	0	67	60.3	44.2	24.5	10.5	3.71
Premature deaths from air pollution - Coal (deaths)	0	7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Natural Gas (deaths)	0	1.77	0.949	0.495	0.362	0.126	0.035
Premature deaths from air pollution - Transportation (deaths)	0	7.53	6.78	4.97	2.75	1.19	0.418

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	0.48	0.516	0	0	0	0
Sales of cooking units - Electric Resistance (%)	46.9	58.2	92.8	99.6	100	100	100
Sales of cooking units - Gas (%)	53.1	41.8	7.15	0.36	0	0	0
Sales of space heating units - Electric Heat Pump (%)	3.07	12.1	61.6	90	93.8	94.1	94.1
Sales of space heating units - Electric Resistance (%)	1.43	1.61	1.3	0.591	0.438	0.433	0.475
Sales of space heating units - Fossil (%)	77.8	76.6	30.1	8.25	5.56	5.39	5.36
Sales of space heating units - Gas (%)	17.8	9.73	6.95	1.18	0.152	0.087	0.086
Sales of water heating units - Electric Heat Pump (%)	0	2.16	17	36.8	40.1	40.3	40.3
Sales of water heating units - Electric Resistance (%)	19.3	34	45.2	57.5	59.5	59.7	59.6
Sales of water heating units - Gas Furnace (%)	54.1	47.8	34.7	5.56	0.327	0	0
Sales of water heating units - Other (%)	26.6	16	3.08	0.198	0.072	0.073	0.073

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	118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047	0	0.305	0	1.27	0	2.04
Public EV charging plugs - L2 (1000 units)	0.543	0	7.34	0	30.5	0	49.1
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 (%)	1.66	1.91	1.3	0.418	0.076	0.013	0
Vehicle sales - Light-duty - EV (%)	3.54	14	44.7	81.1	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.5	79.3	50.6	17.2	3.38	0.593	0
Vehicle sales - Light-duty - hybrid (%)	4.06	4.28	3.09	1.16	0.28	0.061	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.346	0.212	0.066	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.107	0.103	0.068	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 37: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	18.9	17.7	16.9	15.8	14.7	13.9	13.5
Final energy use - Industry (PJ)	20.1	20.1	20.5	19.9	19.4	19.3	19.3
Final energy use - Residential (PJ)	33.2	29.9	26.5	22.3	18.3	15.4	13.7
Final energy use - Transportation (PJ)	51.8	48.3	42.1	34.2	27	22.5	20.5

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	1,350	1,474	0	0	0	0
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump (%)	2.16	10.9	39.6	72.4	77.6	77.8	77.9
Sales of space heating units - Electric Resistance (%)	1.2	4.38	16.6	21.3	22	22.2	22.1
Sales of space heating units - Fossil (%)	61.5	32.1	6.16	0.26	0	0	0
Sales of space heating units - Gas Furnace (%)	35.1	52.6	37.6	6.02	0.358	0	0
Sales of water heating units - Electric Heat Pump (%)	2.07	3.51	16	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	10.3	12.2	23.9	48	52.2	52.5	52.5
Sales of water heating units - Gas Furnace (%)	79.6	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	8.05	4.21	1.92	1.56	1.53	1.54	1.56

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	0.313	0.322	0.616	0.66	0.557	0.583

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	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)	0	0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)	0	0	1.13	0	0	0	0.72
Capital invested - Wind - Constrained (billion $2018)	0	0	0.479	0	0	0.166	0.571

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

Item	2020	2025	2030	2045	2050
Solar - Base land use assumptions (GWh)	60.7	0	0	0	0
Solar - Constrained land use assumptions (GWh)	60.7	0	0	0	0
Wind - Base land use assumptions (GWh)	604	0	1,821	0	1,422
Wind - Constrained land use assumptions (GWh)	604	0	762	309	1,132

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	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	194
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	102

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	14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	511

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

Item	2020	2025	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	9.65
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	10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	4.83
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	5.65

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.26
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	8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	1,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	69.3	0.078	0.077	0.074	0.044	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)	0	16.8	9.16	10.3	7.66	3.42	0.817
Monetary damages from air pollution - Transportation (million 2019$)	0	67	60.3	44.2	24.5	10.5	3.71
Premature deaths from air pollution - Coal (deaths)	0	7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Natural Gas (deaths)	0	1.89	1.04	1.16	0.866	0.386	0.092
Premature deaths from air pollution - Transportation (deaths)	0	7.53	6.78	4.97	2.75	1.19	0.418

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	0.481	0.555	0	0	0	0
Sales of cooking units - Electric Resistance (%)	46.7	48.1	52.9	65.8	83.7	94.7	98.6
Sales of cooking units - Gas (%)	53.3	51.9	47.1	34.2	16.3	5.26	1.42
Sales of space heating units - Electric Heat Pump (%)	3.07	2.85	5.68	14	28.4	40.3	45.7
Sales of space heating units - Electric Resistance (%)	1.43	1.62	1.64	1.66	1.46	1.25	1.16
Sales of space heating units - Fossil (%)	77.8	85.6	82.9	75	62.2	52	47.7
Sales of space heating units - Gas (%)	17.8	9.93	9.83	9.3	7.95	6.45	5.52
Sales of water heating units - Electric Heat Pump (%)	0	0.306	1.16	3.82	9.35	15.4	18.6
Sales of water heating units - Electric Resistance (%)	19.3	32.3	32.8	34.8	38.7	42.6	44.7

Table 45: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	54.1	48.6	48	45.5	39.4	31.5	26.9
Sales of water heating units - Other (%)	26.6	18.8	18	15.8	12.6	10.5	9.75

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	19.7	39.9	136	424	620
Public EV charging plugs - DC Fast (1000 units)	0.047	0	0.104	0	0.478	0	1.31
Public EV charging plugs - L2 (1000 units)	0.543	0	2.49	0	11.5	0	31.4
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 (%)	1.67	2.07	2.08	1.66	1.07	0.552	0.236
Vehicle sales - Light-duty - EV (%)	1.76	4.39	11.3	24.9	47.3	71.3	87.3
Vehicle sales - Light-duty - gasoline (%)	92.2	88	80.5	67.9	47.4	25.6	11.3
Vehicle sales - Light-duty - hybrid (%)	4.2	5.03	5.68	5.22	3.97	2.38	1.16
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.383	0.332	0.256	0.183	0.102	0.047
Vehicle sales - Light-duty - other (%)	0.108	0.111	0.102	0.089	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 47: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	18.9	17.8	17.3	16.8	16.3	15.9	15.6
Final energy use - Industry (PJ)	20.1	20.1	20.7	20.3	20	20	19.8
Final energy use - Residential (PJ)	33.2	30	27.8	25.9	24	22	20
Final energy use - Transportation (PJ)	51.9	48.7	44.2	40.3	37.2	33.7	29.5

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	1,350	1,475	0	0	0	0
Sales of cooking units - Electric Resistance (%)	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Sales of space heating units - Electric Heat Pump (%)	2.16	6.95	8.53	13.3	22.9	32.9	38.2
Sales of space heating units - Electric Resistance (%)	1.2	1.93	2.57	4.61	8	10.5	11.4
Sales of space heating units - Fossil (%)	61.5	37.7	36.8	32.6	25.9	21.5	20.2
Sales of space heating units - Gas Furnace (%)	35.1	53.4	52.1	49.5	43.2	35.1	30.1
Sales of water heating units - Electric Heat Pump (%)	2.07	2.63	3.32	5.68	11.3	18.2	22.2
Sales of water heating units - Electric Resistance (%)	10.3	11.4	11.8	14.3	19.6	26	29.9
Sales of water heating units - Gas Furnace (%)	79.6	81.3	80.5	76	65.6	52.7	44.9
Sales of water heating units - Other (%)	8.05	4.66	4.38	4.02	3.56	3.09	2.97

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	0.233	0.233	0.327	0.339	0.493	0.522

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	0.049	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	95.9	95.9	95.9	95.9	95.9
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0.048	7.89	12	18.1	166	335
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0.043	54.6	46.5	68	1,651	1,879
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	2	4
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0	0	0	0	0
Annual - BECCS (MMT)	0	0	0	0	0	0	0
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	0	0
Cumulative - BECCS (MMT)	0	0	0	0	0	0	0
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
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	0	0
Resource characterization, appraisal, permitting costs (million $2020)	0	0	0	0	0	0	0
Wells and facilities construction costs (million $2020)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	0	0	0	0
Cumulative investment - All (million $2018)	0	0	0	0	0	0	0
Cumulative investment - Spur (million $2018)	0	0	0	0	0	0	0
Cumulative investment - Trunk (million $2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	0
Trunk (km)	0	0	0	0	0	0	0

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	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-332
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	-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-175
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	-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	432
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	16.4
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	468
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	92.3
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	16.4
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	118

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	14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	2.34

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	39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	9.65
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	10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	4.83
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	5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	7.26
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	8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	1,490

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	0.472	0.488	0	0	0	0
Sales of cooking units - Electric Resistance (%)	46.2	46.2	46.2	46.2	46.2	46.2	46.2
Sales of cooking units - Gas (%)	53.8	53.8	53.8	53.8	53.8	53.8	53.8
Sales of space heating units - Electric Heat Pump (%)	2.94	6.21	6.48	6.9	6.99	7.04	7.14
Sales of space heating units - Electric Resistance (%)	1.43	1.56	1.59	1.65	1.6	1.54	1.49
Sales of space heating units - Fossil (%)	77.9	74.6	46.8	27.6	26.4	26.2	26.3
Sales of space heating units - Gas (%)	17.8	17.6	45.2	63.9	65.1	65.3	65.1
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	19.3	32.1	31.9	31.9	31.9	31.8	31.7
Sales of water heating units - Gas Furnace (%)	54.1	48.9	49.1	49.2	49.2	49.3	49.4
Sales of water heating units - Other (%)	26.6	19	19	18.9	18.9	18.9	18.9

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 (%)	1.67	2.06	2.2	2.05	1.85	1.72	1.64
Vehicle sales - Light-duty - EV (%)	3.19	5.12	5.86	7.18	8.77	10.2	11.4
Vehicle sales - Light-duty - gasoline (%)	90.9	87.4	85.4	83.7	81.7	79.8	78.2
Vehicle sales - Light-duty - hybrid (%)	4.07	4.94	6.06	6.64	7.23	7.86	8.39
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.381	0.352	0.315	0.313	0.314	0.325
Vehicle sales - Light-duty - other (%)	0.107	0.111	0.108	0.108	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
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)	18.9	18.1	18	17.8	17.6	17.7	18.3
Final energy use - Industry (PJ)	20.1	20.9	22.3	22.8	23.6	24.9	26
Final energy use - Residential (PJ)	33.2	30.1	28.1	26.6	25.5	24.7	23.9
Final energy use - Transportation (PJ)	51.8	48.7	44.5	41.8	41.5	42.6	44

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	1,333	1,370	0	0	0	0
Sales of cooking units - Electric Resistance (%)	36.9	39	38.6	38.5	38.3	38.5	38.4
Sales of cooking units - Gas (%)	63.1	61	61.4	61.5	61.7	61.5	61.6
Sales of space heating units - Electric Heat Pump (%)	2.16	12.9	41.1	64.2	67.8	68.1	68.2
Sales of space heating units - Electric Resistance (%)	1.2	2.59	7.38	19.7	30	31.8	31.8
Sales of space heating units - Fossil (%)	61.5	35.8	25.1	9.79	1.41	0.111	0
Sales of space heating units - Gas Furnace (%)	35.1	48.7	26.4	6.27	0.795	0.043	0
Sales of water heating units - Electric Heat Pump (%)	2.07	2.37	2.33	2.33	2.32	2.35	2.34

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 (%)	10.3	11.1	10.9	11.1	11.1	11	11
Sales of water heating units - Gas Furnace (%)	79.6	81.8	82.2	82	82	82.3	82.3
Sales of water heating units - Other (%)	8.05	4.7	4.54	4.51	4.58	4.35	4.3

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	0.265	0.269	0.352	0.366	0.338	0.346

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

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	4.2	0	-3.93	-3.51
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.417	0	-0.75	-0.779
Business-as-usual carbon sink - Total (Mt CO2e/y)	3.78	0	-4.68	-4.29
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	0	54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	4,357

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	169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	0	387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	9.65
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	10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	0	20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	4.83
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	5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	38

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	1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	7.26
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	8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	0	25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	1,490

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	188	117	108	104	102	90.2
Monetary damages from air pollution - Natural Gas (million 2019$)	0	12.7	10.5	12.7	12.2	11.7	11.1
Monetary damages from air pollution - Transportation (million 2019$)	0	68	67.2	66.2	65.3	64.5	63.8
Premature deaths from air pollution - Coal (deaths)	0	21	13.2	12.1	11.7	11.4	10.1
Premature deaths from air pollution - Natural Gas (deaths)	0	1.44	1.19	1.43	1.38	1.33	1.25
Premature deaths from air pollution - Transportation (deaths)	0	7.65	7.56	7.44	7.35	7.26	7.18