Net-Zero America - connecticut 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	3.13	3.5	0	0	0	0
Sales of cooking units - Electric Resistance (%)	71.8	77.8	96.2	99.8	100	100	100
Sales of cooking units - Gas (%)	28.2	22.2	3.79	0.191	0	0	0
Sales of space heating units - Electric Heat Pump (%)	7.5	14.9	62.3	88.8	92.4	92.6	92.6
Sales of space heating units - Electric Resistance (%)	4.92	6.44	5.03	2.19	1.67	1.64	1.81
Sales of space heating units - Fossil (%)	53.1	58.8	18.6	6.59	5.61	5.57	5.44
Sales of space heating units - Gas (%)	34.4	19.8	14	2.38	0.3	0.169	0.163
Sales of water heating units - Electric Heat Pump (%)	0	1.56	13.2	30.7	33.7	33.9	33.9
Sales of water heating units - Electric Resistance (%)	35.5	54.6	60.4	65.2	66	66	66
Sales of water heating units - Gas Furnace (%)	46.8	33.5	24.3	3.88	0.229	0	0
Sales of water heating units - Other (%)	17.6	10.3	2.05	0.206	0.126	0.127	0.126

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	549	1,419	2,279	3,460	3,757	3,587
Public EV charging plugs - DC Fast (1000 units)	0.229	0	0.879	0	3.72	0	5.99
Public EV charging plugs - L2 (1000 units)	0.794	0	21.1	0	89.3	0	144
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 (%)	1.31	1.6	1.16	0.37	0.071	0.013	0
Vehicle sales - Light-duty - EV (%)	4.71	17.6	50.1	83.2	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.6	75.2	45.1	15.1	3.1	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.19	5.1	3.47	1.26	0.312	0.069	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.326	0.184	0.056	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.091	0.086	0.054	0.019	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)	120	114	109	101	93.4	88.1	84.9
Final energy use - Industry (PJ)	64.9	63.4	62.5	61.2	61.1	61.8	62.1
Final energy use - Residential (PJ)	155	143	130	112	94.5	81.6	73.9
Final energy use - Transportation (PJ)	228	212	186	152	122	104	95.6

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	7,080	7,732	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 (%)	4.76	11	39.3	72.4	77.8	78.1	78.1
Sales of space heating units - Electric Resistance (%)	2.29	4.46	16.5	21.3	21.9	21.9	21.9
Sales of space heating units - Fossil (%)	42.2	31.2	5.99	0.253	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 (%)	50.7	53.4	38.2	6.11	0.363	0	0
Sales of water heating units - Electric Heat Pump (%)	2.81	3.52	15.9	41	45.5	45.9	45.9
Sales of water heating units - Electric Resistance (%)	13.8	12.6	24	48.1	52.3	52.5	52.5
Sales of water heating units - Gas Furnace (%)	78.2	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	5.24	3.95	1.94	1.61	1.6	1.59	1.61

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	1.3	1.34	3.78	4.11	3.37	3.57

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)	0	0	3.53	1.92	1.05	1.09	0
Capital invested - Solar PV - Constrained (billion $2018)	0	0.09	2.85	0.72	0.909	1.6	0
Capital invested - Wind - Base (billion $2018)	0	0	0.755	0.336	0.169	0	0.073
Capital invested - Wind - Constrained (billion $2018)	0	0	0.822	0.087	0.108	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	169	0	5,252	3,057	1,764	1,943	0
Solar - Constrained land use assumptions (GWh)	112	167	6,115	4,036	2,955	1,265	220
Wind - Base land use assumptions (GWh)	24	0	1,129	523	279	0	133
Wind - Constrained land use assumptions (GWh)	24	0	1,235	140	172	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	0	0	0	0	55
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	0	1,600
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	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	1
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	0	0	0	0.01
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	0.01
Cumulative - All (MMT)	0	0	0	0	0	0	0.01
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	0.01

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	146	146	146	146	146
Cumulative investment - All (million $2018)	0	0	262	262	262	262	262
Cumulative investment - Spur (million $2018)	0	0	0.702	0.702	0.702	0.702	0.703
Cumulative investment - Trunk (million $2018)	0	0	262	262	262	262	262
Spur (km)	0	0	1.21	1.21	1.21	1.21	1.21
Trunk (km)	0	0	145	145	145	145	145

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	-79
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-3.14
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-82.1
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	-41.5
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-1.57
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-43.1
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	54.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	5.72
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	60.2
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	28.7
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	2.86
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	31.5

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	54.6
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	3,043
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	768
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	1,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	10.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	360
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	143
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	224
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	325
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	27.4
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	902
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	128
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	445
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	5.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	120
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	50.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	17
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	109
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	41
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	1,973
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	448
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	801
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	7.77
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	240

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	96.7
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	121
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	217
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	8.94
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	591
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	3.84
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	13.6
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	6.37
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	108
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	835
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	4.47
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	97.6
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	226
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	1.92
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	7.16
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	1.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	65.1
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	404
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	6.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	408
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	2.89
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	10.4

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	7.98
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	131
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	668

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	363	0.585	0.584	0.565	0.337	0.01
Monetary damages from air pollution - Natural Gas (million 2019$)	0	223	119	82.9	82.1	54.6	23.3
Monetary damages from air pollution - Transportation (million 2019$)	0	995	923	697	399	179	67.5
Premature deaths from air pollution - Coal (deaths)	0	40.8	0.066	0.065	0.063	0.038	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	25.2	13.4	9.36	9.27	6.16	2.63
Premature deaths from air pollution - Transportation (deaths)	0	112	104	78.3	44.9	20.2	7.59

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	68.7	79.2	161	61.4	47.7	35	122
By economic sector - Construction (jobs)	5,605	4,586	5,887	5,803	5,929	5,614	7,066
By economic sector - Manufacturing (jobs)	1,612	2,163	3,528	3,391	3,758	4,876	7,051
By economic sector - Mining (jobs)	1,333	1,037	732	463	271	142	70.8
By economic sector - Other (jobs)	749	613	907	885	922	987	1,477
By economic sector - Pipeline (jobs)	267	262	252	171	124	77.9	50.3
By economic sector - Professional (jobs)	2,259	1,973	2,470	2,382	2,473	2,388	3,228
By economic sector - Trade (jobs)	1,729	1,461	1,702	1,627	1,647	1,616	2,201
By economic sector - Utilities (jobs)	3,892	3,810	4,406	5,113	5,821	5,367	6,156
By education level - All sectors - Associates degree or some college (jobs)	5,463	4,997	6,340	6,404	6,838	6,872	8,885
By education level - All sectors - Bachelors degree (jobs)	3,606	3,309	3,996	3,879	4,039	4,054	5,278
By education level - All sectors - Doctoral degree (jobs)	132	116	137	126	127	123	163
By education level - All sectors - High school diploma or less (jobs)	7,436	6,761	8,613	8,557	9,022	9,096	11,851
By education level - All sectors - Masters or professional degree (jobs)	880	800	958	932	969	957	1,245
By resource sector - Biomass (jobs)	285	340	443	175	143	128	520
By resource sector - CO2 (jobs)	0	0	258	0.7	1.78	1.77	1.31
By resource sector - Coal (jobs)	169	54.1	0	0	0	0	0
By resource sector - Grid (jobs)	3,767	3,873	5,650	8,553	10,078	9,742	11,892
By resource sector - Natural Gas (jobs)	2,842	2,665	2,096	1,726	2,137	1,482	950
By resource sector - Nuclear (jobs)	1,110	1,092	889	361	0	0	0
By resource sector - Oil (jobs)	2,746	2,327	1,811	1,242	785	463	240
By resource sector - Solar (jobs)	6,499	5,521	7,776	6,104	6,253	7,768	10,627
By resource sector - Wind (jobs)	99	111	1,120	1,735	1,597	1,519	3,191
Median wages - Annual - All ($2019 per job)	68,624	69,495	69,357	70,702	71,735	71,921	72,238
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	2,875	2,614	3,286	3,307	3,513	3,505	4,507
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	1,243	1,100	1,358	1,377	1,462	1,406	1,764
On-Site or In-Plant Training - Total jobs - None (jobs)	2,867	2,611	3,278	3,205	3,361	3,399	4,455

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)	146	134	171	176	191	189	240
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	10,384	9,524	11,950	11,832	12,469	12,603	16,456
On-the-Job Training - All sectors - 1 to 4 years (jobs)	3,710	3,369	4,229	4,263	4,533	4,510	5,780
On-the-Job Training - All sectors - 4 to 10 years (jobs)	1,222	1,076	1,339	1,368	1,458	1,400	1,755
On-the-Job Training - All sectors - None (jobs)	990	891	1,101	1,066	1,104	1,112	1,463
On-the-Job Training - All sectors - Over 10 years (jobs)	178	162	206	197	204	210	277
On-the-Job Training - All sectors - Up to 1 year (jobs)	11,415	10,485	13,168	13,004	13,696	13,870	18,147
Related work experience - All sectors - 1 to 4 years (jobs)	6,302	5,753	7,164	7,115	7,504	7,518	9,742
Related work experience - All sectors - 4 to 10 years (jobs)	4,088	3,727	4,633	4,616	4,881	4,875	6,284
Related work experience - All sectors - None (jobs)	2,521	2,301	2,900	2,900	3,076	3,078	3,991
Related work experience - All sectors - Over 10 years (jobs)	1,071	992	1,238	1,227	1,296	1,318	1,713
Related work experience - All sectors - Up to 1 year (jobs)	3,533	3,210	4,110	4,040	4,238	4,314	5,692
Wage income - All (million $2019)	1,202	1,111	1,390	1,407	1,506	1,518	1,981

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	212	215	181	145	109	68.9	47.8
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	4,381
Natural gas production - Annual (tcf)	0	0	0	0	0	0	0
Oil consumption - Annual (million bbls)	56.3	52.3	44.4	33	22.4	14.2	7.82
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	1,024
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	3.14	3.73	0	0	0	0
Sales of cooking units - Electric Resistance (%)	71.7	72.5	75.1	81.9	91.4	97.2	99.2
Sales of cooking units - Gas (%)	28.3	27.5	24.9	18.1	8.64	2.79	0.75
Sales of space heating units - Electric Heat Pump (%)	7.5	7.1	12.5	28.5	55.7	78.2	88.3
Sales of space heating units - Electric Resistance (%)	4.92	6.49	6.23	5.8	4.6	2.99	2.13
Sales of space heating units - Fossil (%)	53.1	66.3	61.9	48.5	27.6	13.1	7.61
Sales of space heating units - Gas (%)	34.4	20.1	19.4	17.2	12.1	5.68	1.98
Sales of water heating units - Electric Heat Pump (%)	0	0.484	1.83	6.09	15.2	25.5	31.2
Sales of water heating units - Electric Resistance (%)	35.5	53.7	54.4	56.4	60.1	63.5	65.2
Sales of water heating units - Gas Furnace (%)	46.8	33.9	32.8	29.2	20.5	9.58	3.12
Sales of water heating units - Other (%)	17.6	11.9	11	8.3	4.13	1.41	0.461

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	91	186	634	1,979	2,888
Public EV charging plugs - DC Fast (1000 units)	0.229	0	0.29	0	1.39	0	3.84
Public EV charging plugs - L2 (1000 units)	0.794	0	6.97	0	33.5	0	92.2
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 (%)	1.33	1.78	2.01	1.59	0.999	0.509	0.219
Vehicle sales - Light-duty - EV (%)	2.17	5.3	13.1	27.8	50.5	73.4	88.1
Vehicle sales - Light-duty - gasoline (%)	90.9	86.3	77.7	64.2	43.8	23.4	10.4
Vehicle sales - Light-duty - hybrid (%)	5.4	6.17	6.83	6.1	4.45	2.56	1.22
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.373	0.312	0.234	0.163	0.089	0.042
Vehicle sales - Light-duty - other (%)	0.093	0.096	0.086	0.074	0.053	0.029	0.013
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)	120	114	111	108	105	101	96.5
Final energy use - Industry (PJ)	64.9	63.5	62.9	62.4	62.9	63.5	63.2
Final energy use - Residential (PJ)	155	144	135	128	118	105	91.1
Final energy use - Transportation (PJ)	228	214	195	179	167	152	134

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	7,079	7,740	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 (%)	4.76	7.71	11	20.9	40.9	61.8	73
Sales of space heating units - Electric Resistance (%)	2.29	2.3	3.61	7.63	14.2	19.1	21
Sales of space heating units - Fossil (%)	42.2	36.1	33.8	25.4	12.4	3.94	1.03
Sales of space heating units - Gas Furnace (%)	50.7	53.9	51.7	46	32.5	15.2	4.94
Sales of water heating units - Electric Heat Pump (%)	2.81	2.92	4.33	9.01	20.1	33.9	42
Sales of water heating units - Electric Resistance (%)	13.8	12	13	17.7	28.2	41.2	48.8
Sales of water heating units - Gas Furnace (%)	78.2	80.8	78.7	69.9	49.2	23	7.51
Sales of water heating units - Other (%)	5.24	4.31	3.95	3.35	2.49	1.86	1.68

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	0.975	0.97	1.63	1.7	3.09	3.32

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	-79
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-3.14
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-82.1

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	-41.5
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-1.57
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-43.1
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	54.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	5.72
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	60.2
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	28.7
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	2.86
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	31.5

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	54.6
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	3,043
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	768
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	1,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	10.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	360
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	143
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	224
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	325
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	27.4
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	902
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	128
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	445
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	5.3

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	120
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	50.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	17
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	109
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	41
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	1,973
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	448
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	801
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	7.77
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	240
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	96.7
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	121
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	217
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	8.94
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	591
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	3.84
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	13.6
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	6.37
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	108
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	835
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	4.47
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	97.6
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	226
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	1.92
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	7.16
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	1.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	65.1
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	404
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	6.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	408
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	2.89
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	10.4
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	7.98
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	131
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	668

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	363	0.585	0.584	0.565	0.337	0.01
Monetary damages from air pollution - Natural Gas (million 2019$)	0	221	95.2	40.4	16.6	4.81	5.97
Monetary damages from air pollution - Transportation (million 2019$)	0	1,013	1,020	985	880	695	473
Premature deaths from air pollution - Coal (deaths)	0	40.8	0.066	0.065	0.063	0.038	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	25	10.8	4.57	1.88	0.543	0.675
Premature deaths from air pollution - Transportation (deaths)	0	114	115	111	99	78.2	53.2

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	3.13	3.5	0	0	0	0
Sales of cooking units - Electric Resistance (%)	71.8	77.8	96.2	99.8	100	100	100
Sales of cooking units - Gas (%)	28.2	22.2	3.79	0.191	0	0	0
Sales of space heating units - Electric Heat Pump (%)	7.5	14.9	62.3	88.8	92.4	92.6	92.6
Sales of space heating units - Electric Resistance (%)	4.92	6.44	5.03	2.19	1.67	1.64	1.81
Sales of space heating units - Fossil (%)	53.1	58.8	18.6	6.59	5.61	5.57	5.44
Sales of space heating units - Gas (%)	34.4	19.8	14	2.38	0.3	0.169	0.163
Sales of water heating units - Electric Heat Pump (%)	0	1.56	13.2	30.7	33.7	33.9	33.9

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 (%)	35.5	54.6	60.4	65.2	66	66	66
Sales of water heating units - Gas Furnace (%)	46.8	33.5	24.3	3.88	0.229	0	0
Sales of water heating units - Other (%)	17.6	10.3	2.05	0.206	0.126	0.127	0.126

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	549	1,419	2,279	3,460	3,757	3,587
Public EV charging plugs - DC Fast (1000 units)	0.229	0	0.879	0	3.72	0	5.99
Public EV charging plugs - L2 (1000 units)	0.794	0	21.1	0	89.3	0	144
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 (%)	1.31	1.6	1.16	0.37	0.071	0.013	0
Vehicle sales - Light-duty - EV (%)	4.71	17.6	50.1	83.2	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.6	75.2	45.1	15.1	3.1	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.19	5.1	3.47	1.26	0.312	0.069	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.326	0.184	0.056	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.091	0.086	0.054	0.019	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)	120	114	109	101	93.4	88.1	84.9
Final energy use - Industry (PJ)	64.9	63.4	62.5	61.2	61.1	61.8	62.1
Final energy use - Residential (PJ)	155	143	130	112	94.5	81.6	73.9
Final energy use - Transportation (PJ)	228	212	186	152	122	104	95.6

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	7,080	7,732	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 (%)	4.76	11	39.3	72.4	77.8	78.1	78.1
Sales of space heating units - Electric Resistance (%)	2.29	4.46	16.5	21.3	21.9	21.9	21.9
Sales of space heating units - Fossil (%)	42.2	31.2	5.99	0.253	0	0	0
Sales of space heating units - Gas Furnace (%)	50.7	53.4	38.2	6.11	0.363	0	0
Sales of water heating units - Electric Heat Pump (%)	2.81	3.52	15.9	41	45.5	45.9	45.9
Sales of water heating units - Electric Resistance (%)	13.8	12.6	24	48.1	52.3	52.5	52.5
Sales of water heating units - Gas Furnace (%)	78.2	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	5.24	3.95	1.94	1.61	1.6	1.59	1.61

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	1.3	1.34	3.78	4.11	3.37	3.57

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	3.3	0.826	0.459	0	0
Capital invested - Wind - Base (billion $2018)	0	0	0.755	0.336	0.169	0	0.073

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

Item	2020	2025	2030	2035	2040	2050
Solar - Base land use assumptions (GWh)	169	0	4,930	1,310	771	0
Solar - Constrained land use assumptions (GWh)	169	0	7,480	3,086	1,563	0
Wind - Base land use assumptions (GWh)	24	0	1,129	523	279	133
Wind - Constrained land use assumptions (GWh)	24	0	1,235	140	172	114

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	-79
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-3.14
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-82.1
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	-41.5
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-1.57
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-43.1
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	54.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	5.72
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	60.2
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	28.7
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	2.86
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	31.5

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	54.6
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	3,043
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	768
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	1,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	10.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	360
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	143
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	224
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	325
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	27.4
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	902
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	128
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	445
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	5.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	120
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	50.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	17
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	109
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	41
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	1,973
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	448
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	801
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	7.77
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	240
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	96.7
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	121
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	217
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	8.94

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	104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	591
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	3.84
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	13.6
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	6.37
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	108
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	835
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	4.47
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	97.6
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	226
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	1.92
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	7.16
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	1.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	65.1
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	404
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	6.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	408
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	2.89
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	10.4
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	7.98
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	131
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	668

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	363	0.585	0.584	0.565	0.337	0.01
Monetary damages from air pollution - Natural Gas (million 2019$)	0	210	108	60.8	50.1	18.8	6.07
Monetary damages from air pollution - Transportation (million 2019$)	0	995	923	697	399	179	67.5
Premature deaths from air pollution - Coal (deaths)	0	40.8	0.066	0.065	0.063	0.038	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	23.8	12.1	6.86	5.66	2.12	0.685
Premature deaths from air pollution - Transportation (deaths)	0	112	104	78.3	44.9	20.2	7.59

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	3.13	3.5	0	0	0	0
Sales of cooking units - Electric Resistance (%)	71.8	77.8	96.2	99.8	100	100	100
Sales of cooking units - Gas (%)	28.2	22.2	3.79	0.191	0	0	0
Sales of space heating units - Electric Heat Pump (%)	7.5	14.9	62.3	88.8	92.4	92.6	92.6
Sales of space heating units - Electric Resistance (%)	4.92	6.44	5.03	2.19	1.67	1.64	1.81
Sales of space heating units - Fossil (%)	53.1	58.8	18.6	6.59	5.61	5.57	5.44
Sales of space heating units - Gas (%)	34.4	19.8	14	2.38	0.3	0.169	0.163
Sales of water heating units - Electric Heat Pump (%)	0	1.56	13.2	30.7	33.7	33.9	33.9
Sales of water heating units - Electric Resistance (%)	35.5	54.6	60.4	65.2	66	66	66
Sales of water heating units - Gas Furnace (%)	46.8	33.5	24.3	3.88	0.229	0	0
Sales of water heating units - Other (%)	17.6	10.3	2.05	0.206	0.126	0.127	0.126

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	549	1,419	2,279	3,460	3,757	3,587
Public EV charging plugs - DC Fast (1000 units)	0.229	0	0.879	0	3.72	0	5.99
Public EV charging plugs - L2 (1000 units)	0.794	0	21.1	0	89.3	0	144
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 (%)	1.31	1.6	1.16	0.37	0.071	0.013	0
Vehicle sales - Light-duty - EV (%)	4.71	17.6	50.1	83.2	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.6	75.2	45.1	15.1	3.1	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.19	5.1	3.47	1.26	0.312	0.069	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.326	0.184	0.056	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.091	0.086	0.054	0.019	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)	120	114	109	101	93.4	88.1	84.9
Final energy use - Industry (PJ)	64.9	63.4	62.5	61.2	61.1	61.8	62.1
Final energy use - Residential (PJ)	155	143	130	112	94.5	81.6	73.9
Final energy use - Transportation (PJ)	228	212	186	152	122	104	95.6

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	7,080	7,732	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 (%)	4.76	11	39.3	72.4	77.8	78.1	78.1
Sales of space heating units - Electric Resistance (%)	2.29	4.46	16.5	21.3	21.9	21.9	21.9
Sales of space heating units - Fossil (%)	42.2	31.2	5.99	0.253	0	0	0
Sales of space heating units - Gas Furnace (%)	50.7	53.4	38.2	6.11	0.363	0	0
Sales of water heating units - Electric Heat Pump (%)	2.81	3.52	15.9	41	45.5	45.9	45.9
Sales of water heating units - Electric Resistance (%)	13.8	12.6	24	48.1	52.3	52.5	52.5
Sales of water heating units - Gas Furnace (%)	78.2	80	58.2	9.28	0.549	0	0
Sales of water heating units - Other (%)	5.24	3.95	1.94	1.61	1.6	1.59	1.61

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	1.3	1.34	3.78	4.11	3.37	3.57

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	3.19	0	0	0.619	0	0
Capital invested - Solar PV - Constrained (billion $2018)	0	1.64	1.06	0	1.56	0	0.347
Capital invested - Wind - Base (billion $2018)	0	0	0.273	0	0	0.106	0.283
Capital invested - Wind - Constrained (billion $2018)	0	0	0.396	0	0	0	0.338

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

Item	2020	2025	2030	2040	2045	2050
Solar - Base land use assumptions (GWh)	2,320	4,229	0	1,041	0	0
Solar - Constrained land use assumptions (GWh)	3,653	2,172	1,579	2,641	0	662
Wind - Base land use assumptions (GWh)	24	0	409	0	192	528
Wind - Constrained land use assumptions (GWh)	24	0	604	0	0	631

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	-79
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-3.14
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-82.1
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	-41.5
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-1.57
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-43.1
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	54.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	5.72
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	60.2
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	28.7
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	2.86
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	31.5

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	54.6
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	3,043
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	768
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	1,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	10.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	360
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	143
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	224
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	325
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	27.4
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	902
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	128
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	445
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	5.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	120

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	50.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	17
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	109
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	41
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	1,973
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	448
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	801
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	7.77
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	240
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	96.7
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	121
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	217
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	8.94
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	591
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	3.84
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	13.6
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	6.37
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	108
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	835
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	4.47
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	97.6
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	226
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	1.92
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	7.16

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	1.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	65.1
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	404
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	6.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	408
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	2.89
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	10.4
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	7.98
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	131
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	668

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	363	0.585	0.584	0.565	0.337	0.01
Monetary damages from air pollution - Natural Gas (million 2019$)	0	218	117	134	105	56.8	11.6
Monetary damages from air pollution - Transportation (million 2019$)	0	995	923	697	399	179	67.5
Premature deaths from air pollution - Coal (deaths)	0	40.8	0.066	0.065	0.063	0.038	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	24.6	13.2	15.2	11.9	6.42	1.31
Premature deaths from air pollution - Transportation (deaths)	0	112	104	78.3	44.9	20.2	7.59

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	3.14	3.73	0	0	0	0
Sales of cooking units - Electric Resistance (%)	71.7	72.5	75.1	81.9	91.4	97.2	99.2
Sales of cooking units - Gas (%)	28.3	27.5	24.9	18.1	8.64	2.79	0.75
Sales of space heating units - Electric Heat Pump (%)	7.5	7.1	12.5	28.5	55.7	78.2	88.3
Sales of space heating units - Electric Resistance (%)	4.92	6.49	6.23	5.8	4.6	2.99	2.13
Sales of space heating units - Fossil (%)	53.1	66.3	61.9	48.5	27.6	13.1	7.61
Sales of space heating units - Gas (%)	34.4	20.1	19.4	17.2	12.1	5.68	1.98
Sales of water heating units - Electric Heat Pump (%)	0	0.484	1.83	6.09	15.2	25.5	31.2
Sales of water heating units - Electric Resistance (%)	35.5	53.7	54.4	56.4	60.1	63.5	65.2

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 (%)	46.8	33.9	32.8	29.2	20.5	9.58	3.12
Sales of water heating units - Other (%)	17.6	11.9	11	8.3	4.13	1.41	0.461

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	91	186	634	1,979	2,888
Public EV charging plugs - DC Fast (1000 units)	0.229	0	0.29	0	1.39	0	3.84
Public EV charging plugs - L2 (1000 units)	0.794	0	6.97	0	33.5	0	92.2
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 (%)	1.33	1.78	2.01	1.59	0.999	0.509	0.219
Vehicle sales - Light-duty - EV (%)	2.17	5.3	13.1	27.8	50.5	73.4	88.1
Vehicle sales - Light-duty - gasoline (%)	90.9	86.3	77.7	64.2	43.8	23.4	10.4
Vehicle sales - Light-duty - hybrid (%)	5.4	6.17	6.83	6.1	4.45	2.56	1.22
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.373	0.312	0.234	0.163	0.089	0.042
Vehicle sales - Light-duty - other (%)	0.093	0.096	0.086	0.074	0.053	0.029	0.013
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)	120	114	111	108	105	101	96.5
Final energy use - Industry (PJ)	64.9	63.5	62.9	62.4	62.9	63.5	63.2
Final energy use - Residential (PJ)	155	144	135	128	118	105	91.1
Final energy use - Transportation (PJ)	228	214	195	179	167	152	134

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	7,079	7,740	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 (%)	4.76	7.71	11	20.9	40.9	61.8	73
Sales of space heating units - Electric Resistance (%)	2.29	2.3	3.61	7.63	14.2	19.1	21
Sales of space heating units - Fossil (%)	42.2	36.1	33.8	25.4	12.4	3.94	1.03
Sales of space heating units - Gas Furnace (%)	50.7	53.9	51.7	46	32.5	15.2	4.94
Sales of water heating units - Electric Heat Pump (%)	2.81	2.92	4.33	9.01	20.1	33.9	42
Sales of water heating units - Electric Resistance (%)	13.8	12	13	17.7	28.2	41.2	48.8
Sales of water heating units - Gas Furnace (%)	78.2	80.8	78.7	69.9	49.2	23	7.51
Sales of water heating units - Other (%)	5.24	4.31	3.95	3.35	2.49	1.86	1.68

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	0.975	0.97	1.63	1.7	3.09	3.32

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	0	0	0	0	142
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	0	2,269
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	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	2
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

Table 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	0.01
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	0.01
Cumulative - All (MMT)	0	0	0	0	0	0	0.01
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	0.01

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	146	146	146	146	146
Cumulative investment - All (million $2018)	0	0	262	262	262	262	262
Cumulative investment - Spur (million $2018)	0	0	0.702	0.702	0.702	0.702	0.703
Cumulative investment - Trunk (million $2018)	0	0	262	262	262	262	262
Spur (km)	0	0	1.21	1.21	1.21	1.21	1.21
Trunk (km)	0	0	145	145	145	145	145

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	-79
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	-3.14
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-82.1
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	-41.5
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	-1.57
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-43.1
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	134
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	0.313
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	5.72
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	141
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	28.7
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	0.313
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	2.86
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	31.8

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	54.6
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	3,043
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	768
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	1,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	10.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	360
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	143
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	224
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	325
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	27.4
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	902
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	128
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	445
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	5.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	120
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	50.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	17
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	109
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	41
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	1,973
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	448
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	801
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	7.77
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	240
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	96.7
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	121
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	217
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	8.94

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	104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	591
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	3.84
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	13.6
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	6.37
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	108
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	835
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	4.47
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	97.6
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	226
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	1.92
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	7.16
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	1.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	65.1
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	404
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	6.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	408
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	2.89
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	10.4
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	7.98
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	131
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	668

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	3.06	3.2	0	0	0	0
Sales of cooking units - Electric Resistance (%)	71.5	71.5	71.5	71.5	71.5	71.5	71.5
Sales of cooking units - Gas (%)	28.5	28.5	28.5	28.5	28.5	28.5	28.5
Sales of space heating units - Electric Heat Pump (%)	7.29	8.79	9.1	9.58	9.77	9.98	10.3
Sales of space heating units - Electric Resistance (%)	4.95	6.28	6.15	6.11	6.12	5.85	5.64
Sales of space heating units - Fossil (%)	53.3	57.9	31.1	12.3	11.1	11	11
Sales of space heating units - Gas (%)	34.5	27.1	53.6	72	73	73.2	73.1
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	35.5	53.5	53.4	53.5	53.4	53.4	53.4
Sales of water heating units - Gas Furnace (%)	46.8	34.3	34.3	34.2	34.2	34.2	34.2
Sales of water heating units - Other (%)	17.6	12.3	12.3	12.3	12.3	12.3	12.3

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 (%)	1.32	1.76	2.14	2	1.79	1.67	1.58
Vehicle sales - Light-duty - EV (%)	4.35	6.62	7.45	9.21	11.1	12.7	13.9
Vehicle sales - Light-duty - gasoline (%)	88.9	85.1	82.7	80.6	78.3	76.5	75
Vehicle sales - Light-duty - hybrid (%)	5.22	6.03	7.31	7.85	8.36	8.82	9.12
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.368	0.332	0.292	0.287	0.286	0.296
Vehicle sales - Light-duty - other (%)	0.091	0.095	0.091	0.092	0.091	0.09	0.092
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)	120	116	117	116	115	117	121
Final energy use - Industry (PJ)	64.9	65.9	67.9	70.3	74.3	78.9	82.7
Final energy use - Residential (PJ)	155	145	139	135	132	130	128
Final energy use - Transportation (PJ)	228	214	197	187	187	193	200

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	6,993	7,196	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 (%)	4.76	13	41.2	64.2	67.9	68.3	68.4
Sales of space heating units - Electric Resistance (%)	2.29	2.72	7.48	19.8	29.9	31.6	31.6
Sales of space heating units - Fossil (%)	42.2	34.8	24.4	9.58	1.37	0.108	0
Sales of space heating units - Gas Furnace (%)	50.7	49.5	26.9	6.44	0.813	0.044	0
Sales of water heating units - Electric Heat Pump (%)	2.81	2.41	2.38	2.38	2.36	2.39	2.38

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 (%)	13.8	11.5	11.2	11.4	11.4	11.2	11.3
Sales of water heating units - Gas Furnace (%)	78.2	81.7	82.2	82	82	82.3	82.2
Sales of water heating units - Other (%)	5.24	4.38	4.24	4.21	4.3	4.08	4.12

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	1.02	1.02	2.7	2.9	2.76	2.92

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

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-10.2	0	-1.57	-1.41
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.098	0	-0.176	-0.183
Business-as-usual carbon sink - Total (Mt CO2e/y)	-10.3	0	-1.75	-1.59
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	54.6
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	3,043
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	768
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	1,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	10.4
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	360
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	143
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	224
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	325
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	27.4
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	902
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	128
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	445
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	5.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	120
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	50.1
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	17
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	109
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	41
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	1,973

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	448
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	801
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	7.77
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	240
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	96.7
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	121
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	217
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	8.94
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	104
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	591
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	3.84
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	13.6
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	6.37
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	108
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	835
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	4.47
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	97.6
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	226
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	1.92
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	7.16
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	1.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	65.1
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	404
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	6.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	101

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	408
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	2.89
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	10.4
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	7.98
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	131
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	668

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	1,002	654	613	597	586	524
Monetary damages from air pollution - Natural Gas (million 2019$)	0	149	122	158	173	182	172
Monetary damages from air pollution - Transportation (million 2019$)	0	1,011	1,031	1,048	1,068	1,088	1,109
Premature deaths from air pollution - Coal (deaths)	0	112	73.4	68.8	67	65.8	58.8
Premature deaths from air pollution - Natural Gas (deaths)	0	16.8	13.7	17.9	19.5	20.6	19.5
Premature deaths from air pollution - Transportation (deaths)	0	114	116	118	120	122	125