Net-Zero America - vermont state report

2021-03-18

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

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Notes

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

Data by category and subcategory

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		1,350	1,474				
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 2: *E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		0.313	0.322	0.616	0.66	0.557	0.583

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 - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.48	0.516				
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 5: *E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047		0.305		1.27		2.04
Public EV charging plugs - L2 (1000 units)	0.543		7.34		30.5		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 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	1.03	4.22
Capital invested - Solar PV - Constrained (billion $2018)		0.025	0.104	0	0	4.36	3.86
Capital invested - Wind - Base (billion $2018)		0	2.03	0.534	0.524	0.425	0.362
Capital invested - Wind - Constrained (billion $2018)		0	1.39	0.377	0.727	0.135	0.915
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	204	354	415	486	566	655	755
Installed renewables - Solar - Base land use assumptions (MW)	35.7	35.7	35.7	35.7	35.7	1,262	6,594
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	0	0	0	2,981	6,007
Installed renewables - Wind - Base land use assumptions (MW)	144	144	991	1,230	1,477	1,687	1,877
Installed renewables - Wind - Constrained land use assumptions (MW)	144	144	725	894	1,236	1,303	1,782

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
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	60.7	60.7	60.7	60.7	60.7	1,884	9,749
Solar - Constrained land use assumptions (GWh)	0	0	0	0	0	4,415	8,864
Wind - Base land use assumptions (GWh)	604	604	3,846	4,774	5,738	6,560	7,286
Wind - Constrained land use assumptions (GWh)	604	604	2,807	3,458	4,768	5,010	6,814

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0.021	2.53	3.75	4.15	5.03	16.6
Conversion capital investment - Cumulative 5-yr (million $2018)		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
Annual - BECCS (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	0	0
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							194
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		10.6	8.98	7.2	5.42	3.41	2.37
Natural gas consumption - Cumulative (tcf)							217
Natural gas production - Annual (tcf)		0	0	0	0	0	0
Oil consumption - Annual (million bbls)		20	18.6	16.2	13.9	12.1	10.7
Oil consumption - Cumulative (million bbls)							496
Oil production - Annual (million bbls)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		68.8	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		17.1	9.52	5.85	5.32	3.26	1.32
Monetary damages from air pollution - Transportation (million 2019$)		67	60.3	44.2	24.5	10.5	3.71
Premature deaths from air pollution - Coal (deaths)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Natural Gas (deaths)		1.93	1.07	0.66	0.6	0.368	0.149
Premature deaths from air pollution - Transportation (deaths)		7.53	6.78	4.97	2.75	1.19	0.418

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		28.6	60.2	30.4	25.1	20.5	30.8
By economic sector - Construction (jobs)		944	992	1,021	1,024	1,747	4,857
By economic sector - Manufacturing (jobs)		646	1,155	1,069	1,170	1,656	2,609
By economic sector - Mining (jobs)		300	232	167	119	85.5	63

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		149	117	134	149	342	1,263
By economic sector - Pipeline (jobs)		41.9	38.4	33	27.9	23.4	20.4
By economic sector - Professional (jobs)		423	587	588	616	957	2,452
By economic sector - Trade (jobs)		385	411	406	410	645	1,766
By economic sector - Utilities (jobs)		208	570	615	635	1,086	2,760
By education level - All sectors - Associates degree or some college (jobs)		939	1,278	1,267	1,312	2,094	5,110
By education level - All sectors - Bachelors degree (jobs)		655	872	843	862	1,316	3,086
By education level - All sectors - Doctoral degree (jobs)		23.8	30.2	29.5	30.2	46.2	116
By education level - All sectors - High school diploma or less (jobs)		1,353	1,777	1,726	1,768	2,792	6,743
By education level - All sectors - Masters or professional degree (jobs)		153	205	200	204	316	766
By resource sector - Biomass (jobs)		123	166	86.6	75.6	74.8	132
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		313	1,032	1,134	1,186	2,130	5,566
By resource sector - Natural Gas (jobs)		95.5	78	60.8	44.7	27.5	18.7
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		890	760	610	487	395	330
By resource sector - Solar (jobs)		1,563	1,147	930	1,133	2,665	7,894
By resource sector - Wind (jobs)		140	979	1,243	1,251	1,272	1,881
Median wages - Annual - All ($2019 per job)		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)		492	659	650	669	1,064	2,594
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		196	251	253	258	419	1,074
On-Site or In-Plant Training - Total jobs - None (jobs)		520	688	670	690	1,083	2,608
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		24	33.3	33.5	34.7	55.9	138
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		1,892	2,530	2,457	2,524	3,943	9,407
On-the-Job Training - All sectors - 1 to 4 years (jobs)		625	839	832	856	1,364	3,335
On-the-Job Training - All sectors - 4 to 10 years (jobs)		189	242	246	251	413	1,077
On-the-Job Training - All sectors - None (jobs)		182	229	223	228	359	884
On-the-Job Training - All sectors - Over 10 years (jobs)		33.7	43.3	42.2	43.6	67.9	158
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,095	2,808	2,722	2,798	4,360	10,366
Related work experience - All sectors - 1 to 4 years (jobs)		1,120	1,492	1,456	1,494	2,340	5,637
Related work experience - All sectors - 4 to 10 years (jobs)		711	953	937	963	1,511	3,633
Related work experience - All sectors - None (jobs)		444	591	578	594	942	2,306
Related work experience - All sectors - Over 10 years (jobs)		192	263	257	265	411	955
Related work experience - All sectors - Up to 1 year (jobs)		658	863	837	861	1,361	3,290
Wage income - All (million $2019)		176	240	238	247	391	956

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		1,350	1,475				
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 18: *E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		0.233	0.233	0.327	0.339	0.493	0.522

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 - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.481	0.555				
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 21: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		0	19.7	39.9	136	424	620
Public EV charging plugs - DC Fast (1000 units)	0.047		0.104		0.478		1.31
Public EV charging plugs - L2 (1000 units)	0.543		2.49		11.5		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 22: *E- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							194
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		68.8	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		16.6	7.84	3.09	1.29	0.393	0.341
Monetary damages from air pollution - Transportation (million 2019$)		68.1	66.4	62.2	53.8	41.2	27.2
Premature deaths from air pollution - Coal (deaths)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Natural Gas (deaths)		1.87	0.885	0.349	0.146	0.044	0.038
Premature deaths from air pollution - Transportation (deaths)		7.66	7.46	6.99	6.05	4.64	3.06

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		1,350	1,474				
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 26: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		0.313	0.322	0.616	0.66	0.557	0.583

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 - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.48	0.516				
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 29: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047		0.305		1.27		2.04
Public EV charging plugs - L2 (1000 units)	0.543		7.34		30.5		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 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	1.64	7.68	8.43
Capital invested - Wind - Base (billion $2018)		0	2.03	0.534	0.524	0.425	0.759
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Solar - Base land use assumptions (MW)	35.7	35.7	35.7	35.7	1,881	11,049	21,703
Installed renewables - Solar - Constrained land use assumptions (MW)	71.4	71.4	71.4	71.4	7,123	20,533	40,311
Installed renewables - Wind - Base land use assumptions (MW)	144	144	991	1,230	1,477	1,687	2,086
Installed renewables - Wind - Constrained land use assumptions (MW)	287	287	1,451	1,788	2,471	2,605	3,639

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	60.7	60.7	60.7	60.7	2,816	16,224	31,686
Solar - Constrained land use assumptions (GWh)	121	121	121	121	10,396	30,052	58,702
Wind - Base land use assumptions (GWh)	604	604	3,846	4,774	5,738	6,560	8,066
Wind - Constrained land use assumptions (GWh)	1,207	1,207	5,615	6,915	9,535	10,020	13,895

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							194
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							8.19

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							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$)		68.8	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		15.7	8.4	4.39	3.21	1.12	0.31
Monetary damages from air pollution - Transportation (million 2019$)		67	60.3	44.2	24.5	10.5	3.71
Premature deaths from air pollution - Coal (deaths)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Natural Gas (deaths)		1.77	0.949	0.495	0.362	0.126	0.035
Premature deaths from air pollution - Transportation (deaths)		7.53	6.78	4.97	2.75	1.19	0.418

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		1,350	1,474				
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 36: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		0.313	0.322	0.616	0.66	0.557	0.583

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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.48	0.516				
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 39: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		118	306	489	743	806	770
Public EV charging plugs - DC Fast (1000 units)	0.047		0.305		1.27		2.04
Public EV charging plugs - L2 (1000 units)	0.543		7.34		30.5		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 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
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		0	1.13	0	0	0	0.72
Capital invested - Wind - Constrained (billion $2018)		0	0.479	0	0	0.166	0.571
Installed renewables - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Solar - Base land use assumptions (MW)	35.7	35.7	35.7	35.7	35.7	35.7	35.7
Installed renewables - Solar - Constrained land use assumptions (MW)	35.7	35.7	35.7	35.7	35.7	35.7	35.7
Installed renewables - Wind - Base land use assumptions (MW)	144	144	613	613	613	613	991
Installed renewables - Wind - Constrained land use assumptions (MW)	144	144	343	343	343	426	725

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	60.7	60.7	60.7	60.7	60.7	60.7	60.7
Solar - Constrained land use assumptions (GWh)	60.7	60.7	60.7	60.7	60.7	60.7	60.7
Wind - Base land use assumptions (GWh)	604	604	2,425	2,425	2,425	2,425	3,846
Wind - Constrained land use assumptions (GWh)	604	604	1,366	1,366	1,366	1,675	2,807

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-175
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							175
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							194
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							92.3
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							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$)		68.8	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		16.8	9.17	10.3	7.67	3.42	0.817
Monetary damages from air pollution - Transportation (million 2019$)		67	60.3	44.2	24.5	10.5	3.71
Premature deaths from air pollution - Coal (deaths)		7.77	0.009	0.009	0.008	0.005	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Natural Gas (deaths)		1.89	1.04	1.16	0.866	0.386	0.092
Premature deaths from air pollution - Transportation (deaths)		7.53	6.78	4.97	2.75	1.19	0.418

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		1,350	1,475				
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 46: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		0.233	0.233	0.327	0.339	0.493	0.522

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 - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.481	0.555				
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 48: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	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 49: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)		0	19.7	39.9	136	424	620
Public EV charging plugs - DC Fast (1000 units)	0.047		0.104		0.478		1.31
Public EV charging plugs - L2 (1000 units)	0.543		2.49		11.5		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 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)		0.048	7.89	12	18.1	166	335
Conversion capital investment - Cumulative 5-yr (million $2018)		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

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	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
Annual - BECCS (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	0	0
Cumulative - BECCS (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-332
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-10.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-343
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-175
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-5.31
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-181
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							432
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							16.4
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							19.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							468
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							92.3
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							16.4
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							9.65
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							118

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		68.8	0.077	0.077	0.073	0.043	0.002
Monetary damages from air pollution - Natural Gas (million 2019$)		16.6	7.35	3.66	2.69	1.53	0.488
Monetary damages from air pollution - Transportation (million 2019$)		68.1	66.4	62.2	53.8	41.2	27.2
Premature deaths from air pollution - Coal (deaths)		7.77	0.009	0.009	0.008	0.005	0
Premature deaths from air pollution - Natural Gas (deaths)		1.88	0.83	0.414	0.304	0.173	0.055
Premature deaths from air pollution - Transportation (deaths)		7.66	7.46	6.99	6.05	4.64	3.06

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		1,333	1,370				
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
Sales of water heating units - Electric Resistance (%)	10.3	11.1	10.9	11.1	11.1	11	11

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	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 60: *REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		0.265	0.269	0.352	0.366	0.338	0.346

Table 61: *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 62: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		0.472	0.488				
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 63: *REF scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.119	0.138	0.16	0.186	0.216	0.25	0.29
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.67	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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-14.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-6,582
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-290
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-3,153
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.2
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,532
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-113
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-719
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-734
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-7.17
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-2,132
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-48.3
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,211
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-511
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-39.6
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-54.5
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-248
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-10.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-4,357
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-169
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-2,182
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-19.5
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,021

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-76.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-387
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-491
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							2.34
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							39.2
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,608
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.65
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							10.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							20.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							243
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,934
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							1.17
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							36.8
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							616
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.83
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							5.65
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							3.54
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							147

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							815
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							1.76
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							38
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,112
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.26
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							8.19
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							25.6
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							297
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,490

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

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	4.2		-3.93				-3.51
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.417		-0.75				-0.779
Business-as-usual carbon sink - Total (Mt CO2e/y)	3.78		-4.68				-4.29

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		186	117	107	104	101	89.6
Monetary damages from air pollution - Natural Gas (million 2019$)		12.7	10.5	12.7	12.2	11.8	11.1
Monetary damages from air pollution - Transportation (million 2019$)		68	67.2	66.2	65.3	64.5	63.8
Premature deaths from air pollution - Coal (deaths)		21	13.2	12.1	11.7	11.4	10.1
Premature deaths from air pollution - Natural Gas (deaths)		1.44	1.19	1.43	1.38	1.33	1.25
Premature deaths from air pollution - Transportation (deaths)		7.65	7.56	7.44	7.35	7.26	7.18