Net-Zero America - washington state report

2021-03-18

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 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)		22,776	24,705				
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Sales of space heating units - Electric Heat Pump (%)	2.72	15.7	39.9	56.5	59	59.1	59.1
Sales of space heating units - Electric Resistance (%)	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of water heating units - Electric Heat Pump (%)	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Sales of water heating units - Electric Resistance (%)	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Sales of water heating units - Gas Furnace (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631

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)		3.77	3.88	6.5	6.9	5.9	6.14

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146
Final energy use - Industry (PJ)	342	354	359	361	368	377	387
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Transportation (PJ)	656	650	592	519	454	412	391

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)		4.12	4.1				
Sales of cooking units - Electric Resistance (%)	70.6	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.4	23.2	3.96	0.2	0	0	0
Sales of space heating units - Electric Heat Pump (%)	14	25.2	47.6	59.1	60.7	60.7	60.6
Sales of space heating units - Electric Resistance (%)	35.6	41	35.5	30.7	30	30.2	30.3
Sales of space heating units - Fossil (%)	8.89	13.2	9.93	8.85	8.62	8.41	8.39
Sales of space heating units - Gas (%)	41.5	20.6	6.9	1.33	0.7	0.659	0.662
Sales of water heating units - Electric Heat Pump (%)	0	6.87	37.5	47.6	48.6	48.6	48.6
Sales of water heating units - Electric Resistance (%)	45.5	59.1	48.2	46.1	46.1	46.1	46.1
Sales of water heating units - Gas Furnace (%)	47.5	28.5	9.06	0.967	0.047	0	0
Sales of water heating units - Other (%)	6.95	5.52	5.27	5.27	5.28	5.27	5.28

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)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381
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 (%)	1.51	1.78	1.24	0.397	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	4.05	15.6	47.1	82.1	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.7	77.5	48.1	16.3	3.26	0.589	0
Vehicle sales - Light-duty - hybrid (%)	4.56	4.64	3.26	1.21	0.294	0.065	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.337	0.2	0.062	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.1	0.096	0.062	0.022	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 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	0.003	0.249	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0.008	0.044
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0.02	0.172
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)		0.2	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)		0	0.826	0.787	0.706	0.738	0.057
Capital invested - Wind - Constrained (billion $2018)		0	2.11	3.35	11.6	9.51	1.16
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)	1,788	2,755	3,680	4,796	6,121	7,666	9,495
Installed renewables - Solar - Base land use assumptions (MW)	721	721	721	721	721	721	721
Installed renewables - Solar - Constrained land use assumptions (MW)	696	696	696	696	696	696	696
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,388	3,866	4,354	4,813	5,320	5,361
Installed renewables - Wind - Constrained land use assumptions (MW)	3,421	3,421	4,686	6,666	14,261	20,324	21,419

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	6.64	495	495	495	495	495
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	7.51	51.1
Biomass w/ccu power plant (GWh)	0	0	0	0	0	22.3	216
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)	1,419	1,419	1,419	1,419	1,419	1,419	1,419
Solar - Constrained land use assumptions (GWh)	1,371	1,371	1,371	1,371	1,371	1,371	1,371
Wind - Base land use assumptions (GWh)	11,561	11,561	13,217	14,787	16,215	17,781	17,905
Wind - Constrained land use assumptions (GWh)	11,682	11,682	15,810	21,726	43,208	59,787	62,739

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		49.2	148	149	149	200	644
Conversion capital investment - Cumulative 5-yr (million $2018)		3.83	277	22.3	0	927	8,114
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	1	8
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	3
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	1	1

Table 9: *E+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	3.35	3.32	4.6	15
Annual - BECCS (MMT)		0	0	0	0	1.17	11.5
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	3.35	6.67	11.3	26.3
Cumulative - BECCS (MMT)		0	0	0	0	1.17	12.7
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6
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	776	776	1,019	2,201
Cumulative investment - All (million $2018)		0	0	1,802	1,801	1,948	2,738
Cumulative investment - Spur (million $2018)		0	0	99.8	99.3	246	1,036
Cumulative investment - Trunk (million $2018)		0	0	1,702	1,702	1,702	1,702
Spur (km)		0	0	101	101	344	1,526
Trunk (km)		0	0	675	675	675	675

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)							-1,981
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101
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)							2,798
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,033
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)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,575

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)							-2,170
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707

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)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
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)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266

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)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		238	201	161	121	76.3	52.9
Natural gas consumption - Cumulative (tcf)							4,854
Natural gas production - Annual (tcf)		0	0	0	0	0	0
Oil consumption - Annual (million bbls)		135	119	96.2	74.7	57.8	41.8
Oil consumption - Cumulative (million bbls)							2,955
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$)		63.6	0.07	0.07	0.053	0.033	0
Monetary damages from air pollution - Natural Gas (million 2019$)		59.3	35.2	31.1	30.1	25.2	20.2
Monetary damages from air pollution - Transportation (million 2019$)		1,113	1,077	847	507	238	95
Premature deaths from air pollution - Coal (deaths)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		6.69	3.97	3.51	3.4	2.84	2.28
Premature deaths from air pollution - Transportation (deaths)		125	121	95.3	57	26.7	10.7

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		125	364	389	329	334	783
By economic sector - Construction (jobs)		8,570	8,392	10,289	10,284	9,831	13,352
By economic sector - Manufacturing (jobs)		4,850	7,540	9,472	8,742	7,531	8,676
By economic sector - Mining (jobs)		2,249	1,645	1,105	712	448	269

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		1,146	1,192	1,469	1,726	1,924	3,451
By economic sector - Pipeline (jobs)		418	361	502	229	169	210
By economic sector - Professional (jobs)		3,915	4,130	4,718	5,032	5,150	7,796
By economic sector - Trade (jobs)		3,140	2,993	3,186	3,344	3,411	5,119
By economic sector - Utilities (jobs)		4,450	5,095	7,657	7,723	6,900	7,084
By education level - All sectors - Associates degree or some college (jobs)		8,906	9,838	12,304	12,151	11,388	14,823
By education level - All sectors - Bachelors degree (jobs)		6,016	6,502	7,700	7,523	7,058	9,267
By education level - All sectors - Doctoral degree (jobs)		217	223	250	252	249	361
By education level - All sectors - High school diploma or less (jobs)		12,287	13,619	16,728	16,401	15,290	19,982
By education level - All sectors - Masters or professional degree (jobs)		1,437	1,531	1,805	1,794	1,711	2,305
By resource sector - Biomass (jobs)		537	1,003	1,107	989	1,216	3,342
By resource sector - CO2 (jobs)		0	0	1,741	53.5	90	814
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		5,671	7,561	11,493	14,009	12,552	11,879
By resource sector - Natural Gas (jobs)		2,549	2,064	2,014	1,796	1,380	1,366
By resource sector - Nuclear (jobs)		606	596	346	0.015	0.019	0.038
By resource sector - Oil (jobs)		6,006	4,868	3,624	2,612	1,888	1,284
By resource sector - Solar (jobs)		9,420	9,518	12,164	13,095	14,032	23,686
By resource sector - Wind (jobs)		3,976	6,104	6,298	5,567	4,538	4,367
Median wages - Annual - All ($2019 per job)		68,136	68,415	69,492	70,588	71,567	71,977
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		4,656	5,087	6,322	6,221	5,810	7,507
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		1,923	2,005	2,514	2,489	2,347	3,065
On-Site or In-Plant Training - Total jobs - None (jobs)		4,750	5,226	6,339	6,219	5,850	7,782
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		235	259	331	329	309	398
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		17,299	19,136	23,281	22,863	21,380	27,987
On-the-Job Training - All sectors - 1 to 4 years (jobs)		5,969	6,503	8,110	7,982	7,458	9,623
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,871	1,950	2,470	2,458	2,326	3,050
On-the-Job Training - All sectors - None (jobs)		1,632	1,753	2,087	2,054	1,945	2,628
On-the-Job Training - All sectors - Over 10 years (jobs)		300	331	401	386	358	469
On-the-Job Training - All sectors - Up to 1 year (jobs)		19,093	21,176	25,719	25,241	23,610	30,969
Related work experience - All sectors - 1 to 4 years (jobs)		10,375	11,351	13,836	13,598	12,729	16,616
Related work experience - All sectors - 4 to 10 years (jobs)		6,683	7,277	8,931	8,767	8,201	10,645
Related work experience - All sectors - None (jobs)		4,124	4,537	5,603	5,519	5,179	6,817
Related work experience - All sectors - Over 10 years (jobs)		1,784	1,983	2,424	2,366	2,195	2,807
Related work experience - All sectors - Up to 1 year (jobs)		5,897	6,565	7,993	7,871	7,393	9,853
Wage income - All (million $2019)		1,967	2,170	2,696	2,691	2,555	3,365

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)		22,723	24,348				
Sales of cooking units - Electric Resistance (%)	27.5	31	36.1	49.7	68.6	80.2	84.3
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Sales of space heating units - Electric Heat Pump (%)	2.72	11.9	14.6	22.8	37.2	49.8	55.8
Sales of space heating units - Electric Resistance (%)	18.3	13.9	15.8	21.6	30.6	36.8	39.3
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	79	74.3	69.5	55.6	32.2	13.3	4.9
Sales of water heating units - Electric Heat Pump (%)	1.12	2.39	6.84	19.8	40.6	55.7	61.7
Sales of water heating units - Electric Resistance (%)	3.42	3.14	5.18	11.2	21.3	29.5	33.1
Sales of water heating units - Gas Furnace (%)	94.6	93.8	87.3	68.4	37.5	14.2	4.65
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631

Table 18: *E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.95	2.96	4.08	4.22	5.76	6.07

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	160	163	165	166	164	162	160
Final energy use - Industry (PJ)	342	355	361	367	376	385	395
Final energy use - Residential (PJ)	246	227	207	188	169	150	133
Final energy use - Transportation (PJ)	657	654	611	573	544	510	470

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)		4.1	4.04				
Sales of cooking units - Electric Resistance (%)	70.4	71.2	73.9	81.1	91	97.1	99.2
Sales of cooking units - Gas (%)	29.6	28.8	26.1	18.9	9.03	2.91	0.784
Sales of space heating units - Electric Heat Pump (%)	14	21.3	23.9	31.4	44.1	54.1	58.4
Sales of space heating units - Electric Resistance (%)	35.6	41.8	41.1	39.2	35.8	32.7	31
Sales of space heating units - Fossil (%)	8.89	13.8	13.5	12.4	10.6	9.24	8.81
Sales of space heating units - Gas (%)	41.5	23	21.5	17	9.58	4.03	1.76
Sales of water heating units - Electric Heat Pump (%)	0	1.23	4.71	14.8	30.9	42.3	46.7
Sales of water heating units - Electric Resistance (%)	45.5	61.3	60	56.4	51	47.6	46.5
Sales of water heating units - Gas Furnace (%)	47.5	31.9	29.8	23.3	12.8	4.87	1.59
Sales of water heating units - Other (%)	6.95	5.56	5.52	5.49	5.39	5.31	5.28

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	239	450	1,569	4,778	7,016
Public EV charging plugs - DC Fast (1000 units)	0.551		1.02		3.86		10.1
Public EV charging plugs - L2 (1000 units)	2.37		24.5		92.8		244
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 (%)	1.52	1.94	2.05	1.63	1.04	0.532	0.228
Vehicle sales - Light-duty - EV (%)	1.94	4.79	12.1	26.2	48.8	72.3	87.7
Vehicle sales - Light-duty - gasoline (%)	91.6	87.3	79.3	66.2	45.8	24.6	10.9
Vehicle sales - Light-duty - hybrid (%)	4.73	5.52	6.19	5.61	4.19	2.46	1.19
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.379	0.324	0.246	0.174	0.096	0.045
Vehicle sales - Light-duty - other (%)	0.101	0.105	0.095	0.083	0.059	0.033	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 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)							-1,981
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101
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)							2,798
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235

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)							3,033
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)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,575

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)							-2,170
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629

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)							-49,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
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)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		63.6	0.07	0.07	0.053	0.033	0
Monetary damages from air pollution - Natural Gas (million 2019$)		62.4	33.3	23	17.6	14.2	14.7
Monetary damages from air pollution - Transportation (million 2019$)		1,133	1,189	1,198	1,115	917	648
Premature deaths from air pollution - Coal (deaths)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		7.04	3.76	2.59	1.98	1.6	1.65
Premature deaths from air pollution - Transportation (deaths)		127	134	135	125	103	72.9

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)		22,776	24,705				
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Sales of space heating units - Electric Heat Pump (%)	2.72	15.7	39.9	56.5	59	59.1	59.1
Sales of space heating units - Electric Resistance (%)	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of water heating units - Electric Heat Pump (%)	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Sales of water heating units - Electric Resistance (%)	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Sales of water heating units - Gas Furnace (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631

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)		3.77	3.88	6.5	6.9	5.9	6.14

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146
Final energy use - Industry (PJ)	342	354	359	361	368	377	387
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Transportation (PJ)	656	650	592	519	454	412	391

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)		4.12	4.1				
Sales of cooking units - Electric Resistance (%)	70.6	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.4	23.2	3.96	0.2	0	0	0
Sales of space heating units - Electric Heat Pump (%)	14	25.2	47.6	59.1	60.7	60.7	60.6
Sales of space heating units - Electric Resistance (%)	35.6	41	35.5	30.7	30	30.2	30.3
Sales of space heating units - Fossil (%)	8.89	13.2	9.93	8.85	8.62	8.41	8.39
Sales of space heating units - Gas (%)	41.5	20.6	6.9	1.33	0.7	0.659	0.662
Sales of water heating units - Electric Heat Pump (%)	0	6.87	37.5	47.6	48.6	48.6	48.6
Sales of water heating units - Electric Resistance (%)	45.5	59.1	48.2	46.1	46.1	46.1	46.1
Sales of water heating units - Gas Furnace (%)	47.5	28.5	9.06	0.967	0.047	0	0
Sales of water heating units - Other (%)	6.95	5.52	5.27	5.27	5.28	5.27	5.28

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)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381
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 (%)	1.51	1.78	1.24	0.397	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	4.05	15.6	47.1	82.1	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.7	77.5	48.1	16.3	3.26	0.589	0
Vehicle sales - Light-duty - hybrid (%)	4.56	4.64	3.26	1.21	0.294	0.065	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.337	0.2	0.062	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.1	0.096	0.062	0.022	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 30: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	6.65
Capital invested - Wind - Base (billion $2018)		0	0.898	1.32	2.71	4.51	10.6
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)	721	721	721	721	721	721	9,125
Installed renewables - Solar - Constrained land use assumptions (MW)	1,442	1,442	1,442	1,442	1,442	1,442	28,690
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,388	3,907	4,728	6,492	9,583	17,262
Installed renewables - Wind - Constrained land use assumptions (MW)	6,917	6,917	9,456	25,814	58,410	116,720	193,532

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)	1,419	1,419	1,419	1,419	1,419	1,419	15,515
Solar - Constrained land use assumptions (GWh)	2,837	2,837	2,837	2,837	2,837	2,837	48,345
Wind - Base land use assumptions (GWh)	11,561	11,561	13,355	15,953	21,315	30,373	52,064
Wind - Constrained land use assumptions (GWh)	23,634	23,634	31,885	78,964	166,657	311,488	472,062

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)							-1,981
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101
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)							2,798
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,033
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)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,575

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)							-2,170
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503

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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
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)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2

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)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		63.6	0.07	0.07	0.053	0.033	0
Monetary damages from air pollution - Natural Gas (million 2019$)		55.2	26.2	16.9	15.4	13	4.18
Monetary damages from air pollution - Transportation (million 2019$)		1,113	1,077	847	507	238	95
Premature deaths from air pollution - Coal (deaths)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		6.23	2.96	1.9	1.73	1.47	0.472
Premature deaths from air pollution - Transportation (deaths)		125	121	95.3	57	26.7	10.7

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)		22,776	24,705				
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Sales of space heating units - Electric Heat Pump (%)	2.72	15.7	39.9	56.5	59	59.1	59.1
Sales of space heating units - Electric Resistance (%)	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of water heating units - Electric Heat Pump (%)	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Sales of water heating units - Electric Resistance (%)	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Sales of water heating units - Gas Furnace (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631

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)		3.77	3.88	6.5	6.9	5.9	6.14

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	342	354	359	361	368	377	387
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Transportation (PJ)	656	650	592	519	454	412	391

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)		4.12	4.1				
Sales of cooking units - Electric Resistance (%)	70.6	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.4	23.2	3.96	0.2	0	0	0
Sales of space heating units - Electric Heat Pump (%)	14	25.2	47.6	59.1	60.7	60.7	60.6
Sales of space heating units - Electric Resistance (%)	35.6	41	35.5	30.7	30	30.2	30.3
Sales of space heating units - Fossil (%)	8.89	13.2	9.93	8.85	8.62	8.41	8.39
Sales of space heating units - Gas (%)	41.5	20.6	6.9	1.33	0.7	0.659	0.662
Sales of water heating units - Electric Heat Pump (%)	0	6.87	37.5	47.6	48.6	48.6	48.6
Sales of water heating units - Electric Resistance (%)	45.5	59.1	48.2	46.1	46.1	46.1	46.1
Sales of water heating units - Gas Furnace (%)	47.5	28.5	9.06	0.967	0.047	0	0
Sales of water heating units - Other (%)	6.95	5.52	5.27	5.27	5.28	5.27	5.28

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)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381
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 (%)	1.51	1.78	1.24	0.397	0.074	0.013	0
Vehicle sales - Light-duty - EV (%)	4.05	15.6	47.1	82.1	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.7	77.5	48.1	16.3	3.26	0.589	0
Vehicle sales - Light-duty - hybrid (%)	4.56	4.64	3.26	1.21	0.294	0.065	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.337	0.2	0.062	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.1	0.096	0.062	0.022	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 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	0.377	0
Capital invested - Solar PV - Constrained (billion $2018)		0.437	0	0	1.54	0.688	0
Capital invested - Wind - Base (billion $2018)		0.134	0.485	0.205	0.75	0.37	0
Capital invested - Wind - Constrained (billion $2018)		0.094	1.29	0.695	3.43	5.19	0
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)	721	721	721	721	721	1,171	1,171
Installed renewables - Solar - Constrained land use assumptions (MW)	1,351	1,734	1,734	1,734	3,466	4,287	4,287
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,459	3,739	3,866	4,354	4,607	4,607
Installed renewables - Wind - Constrained land use assumptions (MW)	3,459	3,508	4,255	4,686	6,919	10,482	10,482

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)	1,419	1,419	1,419	1,419	1,419	2,177	2,177
Solar - Constrained land use assumptions (GWh)	2,487	3,131	3,131	3,131	6,048	7,413	7,413
Wind - Base land use assumptions (GWh)	11,561	11,817	12,794	13,217	14,787	15,576	15,576
Wind - Constrained land use assumptions (GWh)	11,817	11,993	14,463	15,810	22,465	32,717	32,717

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)							-1,981
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101

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)							2,798
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,033
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)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,575

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)							-2,170
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377

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)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242

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)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
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)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		63.6	0.07	0.07	0.053	0.033	0
Monetary damages from air pollution - Natural Gas (million 2019$)		57.8	27.7	32.8	38.7	24.2	11.4
Monetary damages from air pollution - Transportation (million 2019$)		1,113	1,077	847	507	238	95
Premature deaths from air pollution - Coal (deaths)		7.18	0.008	0.008	0.006	0.004	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)		6.53	3.13	3.7	4.37	2.73	1.29
Premature deaths from air pollution - Transportation (deaths)		125	121	95.3	57	26.7	10.7

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)		22,723	24,348				
Sales of cooking units - Electric Resistance (%)	27.5	31	36.1	49.7	68.6	80.2	84.3
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Sales of space heating units - Electric Heat Pump (%)	2.72	11.9	14.6	22.8	37.2	49.8	55.8
Sales of space heating units - Electric Resistance (%)	18.3	13.9	15.8	21.6	30.6	36.8	39.3
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	79	74.3	69.5	55.6	32.2	13.3	4.9
Sales of water heating units - Electric Heat Pump (%)	1.12	2.39	6.84	19.8	40.6	55.7	61.7
Sales of water heating units - Electric Resistance (%)	3.42	3.14	5.18	11.2	21.3	29.5	33.1
Sales of water heating units - Gas Furnace (%)	94.6	93.8	87.3	68.4	37.5	14.2	4.65
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631

Table 46: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.95	2.96	4.08	4.22	5.76	6.07

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	160	163	165	166	164	162	160
Final energy use - Industry (PJ)	342	355	361	367	376	385	395
Final energy use - Residential (PJ)	246	227	207	188	169	150	133
Final energy use - Transportation (PJ)	657	654	611	573	544	510	470

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)		4.1	4.04				
Sales of cooking units - Electric Resistance (%)	70.4	71.2	73.9	81.1	91	97.1	99.2
Sales of cooking units - Gas (%)	29.6	28.8	26.1	18.9	9.03	2.91	0.784
Sales of space heating units - Electric Heat Pump (%)	14	21.3	23.9	31.4	44.1	54.1	58.4
Sales of space heating units - Electric Resistance (%)	35.6	41.8	41.1	39.2	35.8	32.7	31
Sales of space heating units - Fossil (%)	8.89	13.8	13.5	12.4	10.6	9.24	8.81
Sales of space heating units - Gas (%)	41.5	23	21.5	17	9.58	4.03	1.76
Sales of water heating units - Electric Heat Pump (%)	0	1.23	4.71	14.8	30.9	42.3	46.7
Sales of water heating units - Electric Resistance (%)	45.5	61.3	60	56.4	51	47.6	46.5

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 (%)	47.5	31.9	29.8	23.3	12.8	4.87	1.59
Sales of water heating units - Other (%)	6.95	5.56	5.52	5.49	5.39	5.31	5.28

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	239	450	1,569	4,778	7,016
Public EV charging plugs - DC Fast (1000 units)	0.551		1.02		3.86		10.1
Public EV charging plugs - L2 (1000 units)	2.37		24.5		92.8		244
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 (%)	1.52	1.94	2.05	1.63	1.04	0.532	0.228
Vehicle sales - Light-duty - EV (%)	1.94	4.79	12.1	26.2	48.8	72.3	87.7
Vehicle sales - Light-duty - gasoline (%)	91.6	87.3	79.3	66.2	45.8	24.6	10.9
Vehicle sales - Light-duty - hybrid (%)	4.73	5.52	6.19	5.61	4.19	2.46	1.19
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.379	0.324	0.246	0.174	0.096	0.045
Vehicle sales - Light-duty - other (%)	0.101	0.105	0.095	0.083	0.059	0.033	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

Table 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	0.004	0.227	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0.008	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0.063	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	7.38	452	452	452	452	452
Biomass w/ccu allam power plant (GWh)	0	0	0	0	8.4	8.4	8.4
Biomass w/ccu power plant (GWh)	0	0	0	0	70.4	70.4	70.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		63.7	192	194	290	684	729
Conversion capital investment - Cumulative 5-yr (million $2018)		4.26	253	26.4	1,350	5,424	624
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	1	6	7
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	1	1
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	3.35	5.03	12.1	13
Annual - BECCS (MMT)		0	0	0	1.71	8.69	9.49
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	3.35	8.38	20.5	33.5
Cumulative - BECCS (MMT)		0	0	0	1.71	10.4	19.9
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6
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	776	984	1,486	1,688
Cumulative investment - All (million $2018)		0	0	1,800	1,935	2,313	2,443
Cumulative investment - Spur (million $2018)		0	0	98.6	233	611	741
Cumulative investment - Trunk (million $2018)		0	0	1,702	1,702	1,702	1,702
Spur (km)		0	0	101	309	811	1,013
Trunk (km)		0	0	675	675	675	675

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)							-0.035
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,981
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)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-0.035
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,027
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)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0.062
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							6,909
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0.016
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							2.81
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							7,146
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0.062
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,458
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0.016
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							2.81
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,578

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)							-2,170
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707

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)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
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)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266

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)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		63.6	0.07	0.07	0.053	0.033	0
Monetary damages from air pollution - Natural Gas (million 2019$)		60.3	31.8	24.2	23.1	19.6	17.4
Monetary damages from air pollution - Transportation (million 2019$)		1,133	1,189	1,198	1,115	917	648
Premature deaths from air pollution - Coal (deaths)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Natural Gas (deaths)		6.81	3.58	2.73	2.6	2.21	1.96
Premature deaths from air pollution - Transportation (deaths)		127	134	135	125	103	72.9

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)		22,575	23,159				
Sales of cooking units - Electric Resistance (%)	27.5	29	29	29	29	28.9	28.9
Sales of cooking units - Gas (%)	72.5	71	71	71	71	71.1	71.1
Sales of space heating units - Electric Heat Pump (%)	2.72	21.4	53.8	64.1	65.2	65.3	65.3
Sales of space heating units - Electric Resistance (%)	18.3	16.1	25.2	30.3	33.5	33.9	34
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of space heating units - Gas Furnace (%)	79	62.5	21	5.54	1.3	0.744	0.697
Sales of water heating units - Electric Heat Pump (%)	1.12	0.821	0.82	0.824	0.831	0.834	0.834
Sales of water heating units - Electric Resistance (%)	3.42	2.42	2.42	2.44	2.44	2.44	2.44

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 (%)	94.6	96.1	96.1	96.1	96.1	96.1	96.1
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631

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)		3.38	3.44	3.99	4.11	3.95	4.04

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	160	165	169	173	178	188	201
Final energy use - Industry (PJ)	342	367	387	404	428	457	490
Final energy use - Residential (PJ)	246	227	210	196	186	179	172
Final energy use - Transportation (PJ)	656	659	625	605	608	624	642

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)		4.1	3.83				
Sales of cooking units - Electric Resistance (%)	70.2	70.2	70.2	70.2	70.2	70.2	70.2
Sales of cooking units - Gas (%)	29.8	29.8	29.8	29.8	29.8	29.8	29.8
Sales of space heating units - Electric Heat Pump (%)	12.4	29.8	30.5	31.7	33.2	35.3	38.5
Sales of space heating units - Electric Resistance (%)	36.2	36.9	36.4	35.6	34.5	32.5	29.2
Sales of space heating units - Fossil (%)	9.05	12.7	11.5	10.8	10.6	10.5	10.6
Sales of space heating units - Gas (%)	42.3	20.7	21.6	21.9	21.7	21.7	21.7
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	45.5	61.7	61.7	61.6	61.6	61.6	61.6
Sales of water heating units - Gas Furnace (%)	47.5	32.7	32.8	32.8	32.8	32.8	32.8
Sales of water heating units - Other (%)	6.95	5.57	5.55	5.6	5.61	5.61	5.61

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 (%)	1.51	1.93	2.18	2.03	1.82	1.7	1.62
Vehicle sales - Light-duty - EV (%)	3.7	5.77	6.57	8.08	9.83	11.3	12.5
Vehicle sales - Light-duty - gasoline (%)	90	86.4	84.2	82.3	80.2	78.3	76.7
Vehicle sales - Light-duty - hybrid (%)	4.57	5.41	6.62	7.18	7.74	8.3	8.72
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.375	0.343	0.304	0.301	0.301	0.312
Vehicle sales - Light-duty - other (%)	0.1	0.104	0.1	0.101	0.1	0.099	0.101
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)							-2,170
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860

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)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
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)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112

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)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144

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)	-27.2		-5.37				-4.47
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-8.11		-13.6				-14.3
Business-as-usual carbon sink - Total (Mt CO2e/y)	-35.3		-19				-18.8

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		271	195	35.8	28.1	25.7	24.2
Monetary damages from air pollution - Natural Gas (million 2019$)		72.7	72	75.4	61	55.4	57.5
Monetary damages from air pollution - Transportation (million 2019$)		1,130	1,203	1,275	1,353	1,434	1,517
Premature deaths from air pollution - Coal (deaths)		30.6	22	4.05	3.18	2.91	2.73
Premature deaths from air pollution - Natural Gas (deaths)		8.21	8.13	8.52	6.89	6.26	6.49
Premature deaths from air pollution - Transportation (deaths)		127	135	143	152	161	171