Net-Zero America - florida state report

Larson et al. 2020

February 2021

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

Notes

- These data are a subset of all data from the study available at https://netzeroamerica.princeton.edu.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one "no new policies" reference scenario. In this document, state-level results are grouped by scenario. For some scenarios, the study generated national, but not state-level results.
- Within results for a given scenario, data tables are organized into corresponding sections of the full net-zero study (e.g., Pillar 1, Pillar 2, etc.)
- Some results are not model outputs, but rather they are limits that apply across all scenarios (e.g., maximum carbon storage potential in agricultural soils).

List of Tables

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	16.2	21.3	0	0	0	0
Sales of cooking units - Electric Resistance (%)	96	96.9	99.5	100	100	100	100
Sales of cooking units - Gas (%)	3.99	3.14	0.538	0.027	0	0	0
Sales of space heating units - Electric Heat Pump (%)	51.7	60.3	83.9	89.2	89.3	89.1	89
Sales of space heating units - Electric Resistance (%)	40	35.5	15	10.4	10.3	10.5	10.6
Sales of space heating units - Fossil (%)	0.822	0.7	0.133	0.006	0	0	0
Sales of space heating units - Gas (%)	7.51	3.51	0.99	0.435	0.414	0.413	0.412
Sales of water heating units - Electric Heat Pump (%)	0	12.3	65.2	77	77.6	77.6	77.6
Sales of water heating units - Electric Resistance (%)	88.4	81.8	31.6	20.4	19.9	19.9	19.9
Sales of water heating units - Gas Furnace (%)	6.88	3.27	0.619	0.026	0	0	0
Sales of water heating units - Other (%)	4.69	2.6	2.57	2.58	2.57	2.54	2.53

Table 2: *E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	3,333	8,621	13,843	21,020	22,822	21,789
Public EV charging plugs - DC Fast (1000 units)	0.717	0	5.18	0	21.9	0	35.3
Public EV charging plugs - L2 (1000 units)	3.3	0	124	0	526	0	848
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 (%)	1.29	1.58	1.16	0.367	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.79	17.9	50.4	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.5	75	44.7	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.27	5.16	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.325	0.182	0.055	0.011	0.002	0
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.019	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	434	437	427	413	402	400	406
Final energy use - Industry (PJ)	555	584	599	624	651	665	684
Final energy use - Residential (PJ)	511	493	475	450	430	422	425
Final energy use - Transportation (PJ)	1,917	1,804	1,617	1,384	1,172	1,037	974

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	66,758	74,510	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	23.9	27	70.6	83.8	84.8	85	85.1
Sales of space heating units - Electric Resistance (%)	22.7	8.53	10.3	12.4	13.2	13	12.8
Sales of space heating units - Fossil (%)	0	3.82	0.711	0.031	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	53.5	60.7	18.4	3.73	1.99	2	2.02
Sales of water heating units - Electric Heat Pump (%)	0.849	10.5	54.3	64	64.4	64.5	64.5
Sales of water heating units - Electric Resistance (%)	20.9	11.5	28.7	32.5	32.7	32.7	32.7
Sales of water heating units - Gas Furnace (%)	69.5	73.9	14	0.589	0	0	0
Sales of water heating units - Other (%)	8.69	4.13	3.09	2.85	2.86	2.83	2.82

Table 5: *E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	7.9	7.56	13.5	13.9	16.3	17

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	0.163	0.013	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0.02	0.005	0.002	0.019
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0.043	0	0.006	2.06	0.012
Capital invested - Offshore Wind - Base (billion $2018)	0	0.266	0	0	1.43	0.916	9.44
Capital invested - Solar PV - Base (billion $2018)	0	12.2	26.3	41.1	26.3	22	0
Capital invested - Solar PV - Constrained (billion $2018)	0	13.8	28.1	31.2	32.4	20.3	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	5.92	326	351	351	351	351
Biomass w/ccu allam power plant (GWh)	0	0	0	20.2	24.9	26.9	45.8
Biomass w/ccu power plant (GWh)	0	0	48.5	48.5	55.5	2,368	2,382
OffshoreWind - Base land use assumptions (GWh)	0	285	0	0	2,505	1,891	22,906
OffshoreWind - Constrained land use assumptions (GWh)	0	285	0	0	2,505	1,891	22,906
Solar - Base land use assumptions (GWh)	6,248	18,703	44,400	74,681	50,683	44,441	0
Solar - Constrained land use assumptions (GWh)	6,093	13,691	47,564	56,861	53,880	50,462	99,591

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	7.28	21.8	58.6	333	579	700
Conversion capital investment - Cumulative 5-yr (million $2018)	0	3.4	221	785	5,743	5,424	2,560
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	2	3	4
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	7	9	12
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	1	2	3	4
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	1	1	2	4	5
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	2	3	4
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0.08	3.73	14.5	24.6	31.4
Annual - BECCS (MMT)	0	0	0.05	0.98	8.35	15.1	18.4
Annual - Cement and lime (MMT)	0	0	0	0	3.32	6.84	7.07
Annual - NGCC (MMT)	0	0	0.03	2.75	2.87	2.62	5.94
Cumulative - All (MMT)	0	0	0.08	3.81	18.3	42.9	74.3
Cumulative - BECCS (MMT)	0	0	0.05	1.03	9.38	24.5	42.8
Cumulative - Cement and lime (MMT)	0	0	0	0	3.32	10.2	17.2
Cumulative - NGCC (MMT)	0	0	0.03	2.78	5.65	8.27	14.2

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)	0	0	4.39	10.6	19.9	31	42.9
Injection wells (wells)	0	0	8	32	56	92	116
Resource characterization, appraisal, permitting costs (million $2020)	0	159	552	785	785	785	785
Wells and facilities construction costs (million $2020)	0	0	245	955	1,702	2,846	3,533

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	739	1,095	1,533	2,279	3,321
Cumulative investment - All (million $2018)	0	0	3,102	3,325	3,600	4,157	4,755
Cumulative investment - Spur (million $2018)	0	0	55	278	553	1,109	1,708
Cumulative investment - Trunk (million $2018)	0	0	3,047	3,047	3,047	3,047	3,047
Spur (km)	0	0	104	460	897	1,644	2,685
Trunk (km)	0	0	636	636	636	636	636

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,077
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-29.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-2,107
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,066
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-14.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,081
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,091
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	53.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	1,144
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0

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

Item	2020	2025	2050
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	559
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	26.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	586

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	1,328
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	38,862
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	3,923
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,195
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	3,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	9,304
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	983
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	462
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	8,095
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,781
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	665
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,529
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	654
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,380
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,929
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	3,101
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	344
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	231
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	613
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,612
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	997
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	25,162
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	2,289
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,287
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,827
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	6,203

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

Item	2020	2025	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	664
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	346
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	4,354
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,196
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	217
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	531
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,159
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,397
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	93.4
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	30.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	230
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,585
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	7,243
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	109
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	499
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,210
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	698
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	49.2
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	39.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	959
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,579
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	163
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	515
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,185
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,051
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	71.3

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	22.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	288
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,931
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	6,227

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	527	2.34	1.72	0.789	0.371	0.022
Monetary damages from air pollution - Natural Gas (million 2019$)	0	741	691	577	515	242	48.8
Monetary damages from air pollution - Transportation (million 2019$)	0	5,828	5,517	4,260	2,502	1,148	438
Premature deaths from air pollution - Coal (deaths)	0	59.2	0.262	0.193	0.088	0.042	0.002
Premature deaths from air pollution - Natural Gas (deaths)	0	83.7	78.1	65.2	58.1	27.3	5.51
Premature deaths from air pollution - Transportation (deaths)	0	655	621	479	281	129	49.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	383	441	914	474	917	1,127	1,077
By economic sector - Construction (jobs)	17,674	23,021	35,821	49,347	48,665	48,605	43,930
By economic sector - Manufacturing (jobs)	14,086	24,447	45,256	46,005	37,098	42,104	34,014
By economic sector - Mining (jobs)	7,181	5,402	3,987	2,732	1,719	1,176	734
By economic sector - Other (jobs)	1,513	2,780	5,563	9,110	9,284	9,894	8,443
By economic sector - Pipeline (jobs)	1,370	1,350	1,447	948	737	544	481
By economic sector - Professional (jobs)	8,726	10,172	14,469	19,882	20,821	21,996	21,481
By economic sector - Trade (jobs)	7,004	7,298	9,870	13,623	13,902	14,675	13,914
By economic sector - Utilities (jobs)	21,985	21,345	26,089	33,401	37,627	39,598	39,980
By education level - All sectors - Associates degree or some college (jobs)	25,131	30,512	45,799	56,567	55,218	58,114	53,112
By education level - All sectors - Bachelors degree (jobs)	16,784	19,613	28,143	33,852	32,816	34,634	31,824
By education level - All sectors - Doctoral degree (jobs)	522	601	834	1,066	1,065	1,112	1,047
By education level - All sectors - High school diploma or less (jobs)	33,519	41,000	62,278	76,175	73,863	77,628	70,372
By education level - All sectors - Masters or professional degree (jobs)	3,966	4,531	6,361	7,863	7,810	8,231	7,700
By resource sector - Biomass (jobs)	1,586	1,893	2,520	1,351	2,761	4,109	4,599
By resource sector - CO2 (jobs)	0	82	2,816	892	1,078	1,646	2,234
By resource sector - Coal (jobs)	3,478	1,089	0	0	0	0	0
By resource sector - Grid (jobs)	26,752	25,278	35,441	55,390	65,497	70,923	74,895
By resource sector - Natural Gas (jobs)	16,154	16,891	14,613	12,227	11,292	9,629	6,185
By resource sector - Nuclear (jobs)	1,948	1,917	1,707	1,058	520	302	0.792
By resource sector - Oil (jobs)	13,563	11,673	9,194	6,500	4,263	2,686	1,516
By resource sector - Solar (jobs)	16,429	37,316	75,398	96,770	80,832	79,408	58,456
By resource sector - Wind (jobs)	12	117	1,727	1,334	4,528	11,015	16,170
Median wages - Annual - All ($2019 per job)	54,325	53,711	53,020	53,538	54,596	55,319	56,620
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	13,069	15,713	23,361	28,856	28,205	29,563	27,056
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	5,330	6,192	8,882	11,382	11,417	11,790	10,959
On-Site or In-Plant Training - Total jobs - None (jobs)	12,820	15,682	23,565	28,751	27,791	29,270	26,568

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)	677	814	1,210	1,516	1,503	1,577	1,459
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	48,025	57,855	86,398	105,017	101,854	107,518	98,013
On-the-Job Training - All sectors - 1 to 4 years (jobs)	16,829	20,187	29,911	37,029	36,265	37,968	34,809
On-the-Job Training - All sectors - 4 to 10 years (jobs)	5,165	6,024	8,699	11,283	11,375	11,734	10,921
On-the-Job Training - All sectors - None (jobs)	4,276	5,170	7,689	9,484	9,179	9,645	8,745
On-the-Job Training - All sectors - Over 10 years (jobs)	765	1,000	1,561	1,867	1,738	1,821	1,605
On-the-Job Training - All sectors - Up to 1 year (jobs)	52,887	63,876	95,555	115,859	112,215	118,551	107,975
Related work experience - All sectors - 1 to 4 years (jobs)	28,991	34,489	50,873	62,242	60,724	63,879	58,467
Related work experience - All sectors - 4 to 10 years (jobs)	18,737	22,355	32,886	40,298	39,289	41,252	37,817
Related work experience - All sectors - None (jobs)	11,515	13,844	20,624	25,395	24,891	26,193	23,942
Related work experience - All sectors - Over 10 years (jobs)	5,043	6,133	9,149	10,989	10,544	11,139	10,136
Related work experience - All sectors - Up to 1 year (jobs)	15,636	19,435	29,884	36,599	35,324	37,257	33,693
Wage income - All (million $2019)	4,342	5,170	7,605	9,398	9,325	9,943	9,290

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	1,127	1,143	964	773	582	366	254
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	23,282
Natural gas production - Annual (tcf)	0.634	0.703	0.665	0.579	0.49	0.388	0.302
Oil consumption - Annual (million bbls)	267	251	213	161	113	74.7	44.5
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	4,994
Oil production - Annual (million bbls)	2.2	2.38	2.39	2.39	1.89	1.54	1.02

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	16	20	0	0	0	0
Sales of cooking units - Electric Resistance (%)	96	96.1	96.5	97.4	98.8	99.6	99.9
Sales of cooking units - Gas (%)	4.01	3.91	3.54	2.57	1.23	0.395	0.106
Sales of space heating units - Electric Heat Pump (%)	51.7	55.7	58.3	66.2	77.9	85.5	88.2
Sales of space heating units - Electric Resistance (%)	40	39.5	37.2	30.4	20.2	13.6	11.3
Sales of space heating units - Fossil (%)	0.822	0.81	0.749	0.558	0.266	0.083	0.021
Sales of space heating units - Gas (%)	7.51	3.99	3.69	2.89	1.63	0.801	0.513
Sales of water heating units - Electric Heat Pump (%)	0	2.12	8.14	25.5	52.1	69.4	75.5
Sales of water heating units - Electric Resistance (%)	88.4	91.5	85.8	69.3	44.1	27.6	21.9
Sales of water heating units - Gas Furnace (%)	6.88	3.79	3.49	2.63	1.29	0.412	0.107
Sales of water heating units - Other (%)	4.69	2.6	2.57	2.58	2.57	2.54	2.52

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	0	553	1,131	3,850	12,021	17,546
Public EV charging plugs - DC Fast (1000 units)	0.717	0	1.71	0	8.21	0	22.6
Public EV charging plugs - L2 (1000 units)	3.3	0	41.1	0	197	0	543
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.332	0.969	2.74	7.17	15.7	26.3	34
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.3	1.76	2.01	1.59	0.995	0.506	0.218
Vehicle sales - Light-duty - EV (%)	2.19	5.36	13.2	28	50.7	73.5	88.2
Vehicle sales - Light-duty - gasoline (%)	90.8	86.2	77.5	63.9	43.6	23.3	10.3
Vehicle sales - Light-duty - hybrid (%)	5.48	6.25	6.9	6.15	4.49	2.58	1.22
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.373	0.311	0.232	0.161	0.088	0.041
Vehicle sales - Light-duty - other (%)	0.092	0.095	0.085	0.073	0.052	0.028	0.013
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	434	438	434	430	423	419	420
Final energy use - Industry (PJ)	555	584	600	630	661	675	696
Final energy use - Residential (PJ)	511	494	487	477	464	448	440
Final energy use - Transportation (PJ)	1,919	1,820	1,686	1,572	1,479	1,369	1,239

Table 20: *E- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	66,742	74,583	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	23.9	18.7	23.8	38	60.4	76.6	82.8
Sales of space heating units - Electric Resistance (%)	22.7	8.23	8.33	9.11	10.8	11.9	12.5
Sales of space heating units - Fossil (%)	0	4.41	4	3.07	1.56	0.485	0.126
Sales of space heating units - Gas Furnace (%)	53.5	68.6	63.8	49.8	27.3	11	4.53
Sales of water heating units - Electric Heat Pump (%)	0.849	2.05	7.03	21.4	43.4	57.8	62.8
Sales of water heating units - Electric Resistance (%)	20.9	8.16	9.94	15.6	24.4	30	32
Sales of water heating units - Gas Furnace (%)	69.5	85.5	78.7	59.1	28.9	9.24	2.41
Sales of water heating units - Other (%)	8.69	4.32	4.29	3.91	3.39	3	2.87

Table 21: *E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	6.42	5.91	9.28	9.23	14.5	15.1

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,077
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-29.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-2,107

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

Item	2020	2025	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,066
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-14.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,081
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,091
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	53.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	1,144
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	559
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	26.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	586

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	1,328
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	38,862
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	3,923
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,195
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	3,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	9,304
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	983
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	462
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	8,095
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,781
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	665
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,529
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	654
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,380
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,929

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

Item	2020	2025	2050
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	3,101
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	344
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	231
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	613
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,612
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	997
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	25,162
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	2,289
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,287
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,827
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	6,203
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	664
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	346
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	4,354
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,196
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	217
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	531
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,159
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,397
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	93.4
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	30.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	230
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,585
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	7,243
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	109
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	499
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,210
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	698
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	49.2
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	39.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	959
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,579
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	163
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	515
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,185
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,051
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	71.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	22.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	288
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,931
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	6,227

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	527	2.34	1.72	0.789	0.371	0.022
Monetary damages from air pollution - Natural Gas (million 2019$)	0	742	586	329	119	26	12.1
Monetary damages from air pollution - Transportation (million 2019$)	0	5,938	6,110	6,052	5,549	4,499	3,142
Premature deaths from air pollution - Coal (deaths)	0	59.2	0.262	0.193	0.088	0.042	0.002
Premature deaths from air pollution - Natural Gas (deaths)	0	83.8	66.2	37.2	13.5	2.94	1.37
Premature deaths from air pollution - Transportation (deaths)	0	668	687	681	624	506	353

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	16.2	21.3	0	0	0	0
Sales of cooking units - Electric Resistance (%)	96	96.9	99.5	100	100	100	100
Sales of cooking units - Gas (%)	3.99	3.14	0.538	0.027	0	0	0
Sales of space heating units - Electric Heat Pump (%)	51.7	60.3	83.9	89.2	89.3	89.1	89
Sales of space heating units - Electric Resistance (%)	40	35.5	15	10.4	10.3	10.5	10.6
Sales of space heating units - Fossil (%)	0.822	0.7	0.133	0.006	0	0	0
Sales of space heating units - Gas (%)	7.51	3.51	0.99	0.435	0.414	0.413	0.412
Sales of water heating units - Electric Heat Pump (%)	0	12.3	65.2	77	77.6	77.6	77.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	88.4	81.8	31.6	20.4	19.9	19.9	19.9
Sales of water heating units - Gas Furnace (%)	6.88	3.27	0.619	0.026	0	0	0
Sales of water heating units - Other (%)	4.69	2.6	2.57	2.58	2.57	2.54	2.53

Table 26: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	3,333	8,621	13,843	21,020	22,822	21,789
Public EV charging plugs - DC Fast (1000 units)	0.717	0	5.18	0	21.9	0	35.3
Public EV charging plugs - L2 (1000 units)	3.3	0	124	0	526	0	848
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 (%)	1.29	1.58	1.16	0.367	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.79	17.9	50.4	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.5	75	44.7	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.27	5.16	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.325	0.182	0.055	0.011	0.002	0
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.019	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	434	437	427	413	402	400	406
Final energy use - Industry (PJ)	555	584	599	624	651	665	684
Final energy use - Residential (PJ)	511	493	475	450	430	422	425
Final energy use - Transportation (PJ)	1,917	1,804	1,617	1,384	1,172	1,037	974

Table 28: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	66,758	74,510	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	23.9	27	70.6	83.8	84.8	85	85.1
Sales of space heating units - Electric Resistance (%)	22.7	8.53	10.3	12.4	13.2	13	12.8
Sales of space heating units - Fossil (%)	0	3.82	0.711	0.031	0	0	0
Sales of space heating units - Gas Furnace (%)	53.5	60.7	18.4	3.73	1.99	2	2.02
Sales of water heating units - Electric Heat Pump (%)	0.849	10.5	54.3	64	64.4	64.5	64.5
Sales of water heating units - Electric Resistance (%)	20.9	11.5	28.7	32.5	32.7	32.7	32.7
Sales of water heating units - Gas Furnace (%)	69.5	73.9	14	0.589	0	0	0
Sales of water heating units - Other (%)	8.69	4.13	3.09	2.85	2.86	2.83	2.82

Table 29: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	7.9	7.56	13.5	13.9	16.3	17

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion $2018)	0	0.266	0	1.45	8.16	5.68	5.24
Capital invested - Solar PV - Base (billion $2018)	0	5.09	34.1	59.5	23.6	0	136

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	285	0	2,145	14,243	11,728	12,695
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	27,587
Solar - Base land use assumptions (GWh)	6,248	7,766	57,586	108,121	44,951	0	297,773
Solar - Constrained land use assumptions (GWh)	6,248	9,837	70,530	108,090	30,111	0	308,278

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,077
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-29.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-2,107
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,066
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-14.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,081
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,091
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	53.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	1,144
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	559
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	26.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	586

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	1,328
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	38,862
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	3,923
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,195
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	3,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	9,304
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	983
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	462
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	8,095
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,781
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	665
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,529
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	654
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,380
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,929
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	3,101
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	344
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	231
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	613
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,612
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	997
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	25,162
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	2,289
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,287
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,827
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	6,203
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	664
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	346
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	4,354
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,196
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	217

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

Item	2020	2025	2050
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	531
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,159
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,397
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	93.4
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	30.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	230
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,585
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	7,243
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	109
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	499
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,210
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	698
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	49.2
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	39.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	959
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,579
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	163
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	515
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,185
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,051
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	71.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	22.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	288
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,931
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	6,227

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	527	2.34	1.72	0.789	0.371	0.022
Monetary damages from air pollution - Natural Gas (million 2019$)	0	739	642	468	288	58.6	24.8
Monetary damages from air pollution - Transportation (million 2019$)	0	5,828	5,517	4,260	2,502	1,148	438
Premature deaths from air pollution - Coal (deaths)	0	59.2	0.262	0.193	0.088	0.042	0.002
Premature deaths from air pollution - Natural Gas (deaths)	0	83.4	72.5	52.9	32.5	6.61	2.8
Premature deaths from air pollution - Transportation (deaths)	0	655	621	479	281	129	49.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	16.2	21.3	0	0	0	0
Sales of cooking units - Electric Resistance (%)	96	96.9	99.5	100	100	100	100
Sales of cooking units - Gas (%)	3.99	3.14	0.538	0.027	0	0	0
Sales of space heating units - Electric Heat Pump (%)	51.7	60.3	83.9	89.2	89.3	89.1	89
Sales of space heating units - Electric Resistance (%)	40	35.5	15	10.4	10.3	10.5	10.6
Sales of space heating units - Fossil (%)	0.822	0.7	0.133	0.006	0	0	0
Sales of space heating units - Gas (%)	7.51	3.51	0.99	0.435	0.414	0.413	0.412
Sales of water heating units - Electric Heat Pump (%)	0	12.3	65.2	77	77.6	77.6	77.6
Sales of water heating units - Electric Resistance (%)	88.4	81.8	31.6	20.4	19.9	19.9	19.9
Sales of water heating units - Gas Furnace (%)	6.88	3.27	0.619	0.026	0	0	0
Sales of water heating units - Other (%)	4.69	2.6	2.57	2.58	2.57	2.54	2.53

Table 36: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	3,333	8,621	13,843	21,020	22,822	21,789
Public EV charging plugs - DC Fast (1000 units)	0.717	0	5.18	0	21.9	0	35.3
Public EV charging plugs - L2 (1000 units)	3.3	0	124	0	526	0	848
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 (%)	1.29	1.58	1.16	0.367	0.07	0.013	0
Vehicle sales - Light-duty - EV (%)	4.79	17.9	50.4	83.4	96.5	99.3	100
Vehicle sales - Light-duty - gasoline (%)	88.5	75	44.7	14.9	3.08	0.584	0
Vehicle sales - Light-duty - hybrid (%)	5.27	5.16	3.5	1.27	0.314	0.07	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.325	0.182	0.055	0.011	0.002	0
Vehicle sales - Light-duty - other (%)	0.09	0.085	0.053	0.019	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	434	437	427	413	402	400	406
Final energy use - Industry (PJ)	555	584	599	624	651	665	684
Final energy use - Residential (PJ)	511	493	475	450	430	422	425
Final energy use - Transportation (PJ)	1,917	1,804	1,617	1,384	1,172	1,037	974

Table 38: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	66,758	74,510	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Sales of space heating units - Electric Heat Pump (%)	23.9	27	70.6	83.8	84.8	85	85.1
Sales of space heating units - Electric Resistance (%)	22.7	8.53	10.3	12.4	13.2	13	12.8
Sales of space heating units - Fossil (%)	0	3.82	0.711	0.031	0	0	0
Sales of space heating units - Gas Furnace (%)	53.5	60.7	18.4	3.73	1.99	2	2.02
Sales of water heating units - Electric Heat Pump (%)	0.849	10.5	54.3	64	64.4	64.5	64.5
Sales of water heating units - Electric Resistance (%)	20.9	11.5	28.7	32.5	32.7	32.7	32.7
Sales of water heating units - Gas Furnace (%)	69.5	73.9	14	0.589	0	0	0
Sales of water heating units - Other (%)	8.69	4.13	3.09	2.85	2.86	2.83	2.82

Table 39: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	7.9	7.56	13.5	13.9	16.3	17

Table 40: *E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion $2018)	0	0.266	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)	0	14.6	17.6	1.46	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)	0	14.8	16.7	1.56	0	0.104	0

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

Item	2020	2025	2030	2035	2045
OffshoreWind - Base land use assumptions (GWh)	0	285	0	0	0
Solar - Base land use assumptions (GWh)	6,248	22,303	29,753	2,681	0
Solar - Constrained land use assumptions (GWh)	6,248	22,584	28,301	2,824	212

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,077
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-29.6
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-2,107
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,066

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

Item	2020	2025	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-14.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,081
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	1,091
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	53.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	1,144
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	559
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	26.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	586

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	1,328
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	38,862
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	3,923
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,195
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	3,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	9,304
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	983
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	462
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	8,095
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,781
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	665
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,529
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	654
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,380
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,929
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	3,101
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	344

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

Item	2020	2025	2050
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	231
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	613
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,612
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	997
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	25,162
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	2,289
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,287
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,827
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	6,203
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	664
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	346
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	4,354
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,196
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	217
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	531
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,159
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,397
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	93.4
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	30.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	230
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,585
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	7,243
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	109
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	499
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,210
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	698
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	49.2
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	15.3

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	39.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	959
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,579
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	163
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	515
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,185
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,051
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	71.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	22.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	288
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,931
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	6,227

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	527	2.34	1.72	0.789	0.371	0.022
Monetary damages from air pollution - Natural Gas (million 2019$)	0	731	705	535	481	218	32.3
Monetary damages from air pollution - Transportation (million 2019$)	0	5,828	5,517	4,260	2,502	1,148	438
Premature deaths from air pollution - Coal (deaths)	0	59.2	0.262	0.193	0.088	0.042	0.002
Premature deaths from air pollution - Natural Gas (deaths)	0	82.6	79.6	60.5	54.3	24.6	3.65
Premature deaths from air pollution - Transportation (deaths)	0	655	621	479	281	129	49.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	16	20	0	0	0	0
Sales of cooking units - Electric Resistance (%)	96	96.1	96.5	97.4	98.8	99.6	99.9
Sales of cooking units - Gas (%)	4.01	3.91	3.54	2.57	1.23	0.395	0.106
Sales of space heating units - Electric Heat Pump (%)	51.7	55.7	58.3	66.2	77.9	85.5	88.2
Sales of space heating units - Electric Resistance (%)	40	39.5	37.2	30.4	20.2	13.6	11.3
Sales of space heating units - Fossil (%)	0.822	0.81	0.749	0.558	0.266	0.083	0.021
Sales of space heating units - Gas (%)	7.51	3.99	3.69	2.89	1.63	0.801	0.513
Sales of water heating units - Electric Heat Pump (%)	0	2.12	8.14	25.5	52.1	69.4	75.5
Sales of water heating units - Electric Resistance (%)	88.4	91.5	85.8	69.3	44.1	27.6	21.9
Sales of water heating units - Gas Furnace (%)	6.88	3.79	3.49	2.63	1.29	0.412	0.107
Sales of water heating units - Other (%)	4.69	2.6	2.57	2.58	2.57	2.54	2.52

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	0	553	1,131	3,850	12,021	17,546
Public EV charging plugs - DC Fast (1000 units)	0.717	0	1.71	0	8.21	0	22.6
Public EV charging plugs - L2 (1000 units)	3.3	0	41.1	0	197	0	543
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 (%)	1.3	1.76	2.01	1.59	0.995	0.506	0.218
Vehicle sales - Light-duty - EV (%)	2.19	5.36	13.2	28	50.7	73.5	88.2
Vehicle sales - Light-duty - gasoline (%)	90.8	86.2	77.5	63.9	43.6	23.3	10.3
Vehicle sales - Light-duty - hybrid (%)	5.48	6.25	6.9	6.15	4.49	2.58	1.22
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.373	0.311	0.232	0.161	0.088	0.041
Vehicle sales - Light-duty - other (%)	0.092	0.095	0.085	0.073	0.052	0.028	0.013
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	434	438	434	430	423	419	420
Final energy use - Industry (PJ)	555	584	600	630	661	675	696
Final energy use - Residential (PJ)	511	494	487	477	464	448	440
Final energy use - Transportation (PJ)	1,919	1,820	1,686	1,572	1,479	1,369	1,239

Table 48: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	66,742	74,583	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Sales of space heating units - Electric Heat Pump (%)	23.9	18.7	23.8	38	60.4	76.6	82.8
Sales of space heating units - Electric Resistance (%)	22.7	8.23	8.33	9.11	10.8	11.9	12.5
Sales of space heating units - Fossil (%)	0	4.41	4	3.07	1.56	0.485	0.126
Sales of space heating units - Gas Furnace (%)	53.5	68.6	63.8	49.8	27.3	11	4.53
Sales of water heating units - Electric Heat Pump (%)	0.849	2.05	7.03	21.4	43.4	57.8	62.8
Sales of water heating units - Electric Resistance (%)	20.9	8.16	9.94	15.6	24.4	30	32
Sales of water heating units - Gas Furnace (%)	69.5	85.5	78.7	59.1	28.9	9.24	2.41
Sales of water heating units - Other (%)	8.69	4.32	4.29	3.91	3.39	3	2.87

Table 49: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	6.42	5.91	9.28	9.23	14.5	15.1

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	0.523	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0.038	0.007	0.016	0.021
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0.049	11.5	2.18	5.85	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	7.52	1,035	1,035	1,035	1,035	1,035
Biomass w/ccu allam power plant (GWh)	0	0	0	37.7	44.2	60.6	81.5
Biomass w/ccu power plant (GWh)	0	0	55.3	12,921	15,365	21,928	21,928

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	1.01	80.4	1,065	1,523	2,465	2,875
Conversion capital investment - Cumulative 5-yr (million $2018)	0	4.32	629	12,720	5,513	11,510	4,739
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	2	3	4
Number of facilities - Beccs hydrogen (quantity)	0	0	0	2	6	13	18
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	1	2	3	3
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	1	10	12	17	17
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	2	4	5
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0.07	17.3	27.8	45.3	53
Annual - BECCS (MMT)	0	0	0.06	15.5	22.4	36.8	42.7
Annual - Cement and lime (MMT)	0	0	0	0	3.32	6.84	7.07
Annual - NGCC (MMT)	0	0	0.02	1.74	2.06	1.65	3.24
Cumulative - All (MMT)	0	0	0.07	17.3	45.1	90.4	144
Cumulative - BECCS (MMT)	0	0	0.06	15.6	38	74.8	118
Cumulative - Cement and lime (MMT)	0	0	0	0	3.32	10.2	17.2
Cumulative - NGCC (MMT)	0	0	0.02	1.76	3.82	5.47	8.71

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)	0	0	3.69	15	33.3	45.3	48.5
Injection wells (wells)	0	0	8	34	62	102	128
Resource characterization, appraisal, permitting costs (million $2020)	0	159	625	906	906	906	906
Wells and facilities construction costs (million $2020)	0	0	270	1,053	1,877	3,138	3,896

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	886	1,358	1,622	2,448	3,203
Cumulative investment - All (million $2018)	0	0	3,177	3,655	4,152	4,884	5,383
Cumulative investment - Spur (million $2018)	0	0	129	608	902	1,634	2,133
Cumulative investment - Trunk (million $2018)	0	0	3,047	3,047	3,250	3,250	3,250
Spur (km)	0	0	251	722	986	1,813	2,568
Trunk (km)	0	0	636	636	636	636	636

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-12.5
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,056
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-29.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-2,098
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-12.5
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,055
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)	0	0	0
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-14.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,082
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	7.89
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	2,674
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	5.31
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	365
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	52.9
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	3,105
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	7.89
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	555
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	5.31
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	365
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	26.5
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	960

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	1,328
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	38,862
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	3,923
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,195
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	3,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	9,304
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	983
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	462
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	8,095
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,781
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	665
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,529
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	654
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,380
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	1,929
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	3,101
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	344
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	231
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	613
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,612
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	997
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	25,162
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	2,289
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,287
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	2,827
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	6,203
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	664
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	346
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	4,354
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	3,196
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	217

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

Item	2020	2025	2050
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	531
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,159
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	1,397
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	93.4
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	30.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	230
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,585
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	7,243
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	109
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	499
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,210
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	698
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	49.2
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	39.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	959
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,579
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	163
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	515
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,185
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	1,051
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	71.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	22.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	288
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,931
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	6,227

Table 58: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	15.8	16.2	0	0	0	0
Sales of cooking units - Electric Resistance (%)	96	96	96	96	96	96	96
Sales of cooking units - Gas (%)	4.04	4.04	4.04	4.04	4.04	4.04	4.04
Sales of space heating units - Electric Heat Pump (%)	51.1	66.6	66.9	67.9	68.8	70.5	73.6
Sales of space heating units - Electric Resistance (%)	40.4	30.3	30.1	29.2	28.4	26.7	23.6
Sales of space heating units - Fossil (%)	0.826	0.333	0.334	0.332	0.321	0.314	0.316
Sales of space heating units - Gas (%)	7.6	2.83	2.7	2.57	2.51	2.48	2.48
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	88.4	93.5	93.5	93.5	93.5	93.5	93.5
Sales of water heating units - Gas Furnace (%)	6.88	3.89	3.9	3.92	3.93	3.93	3.93
Sales of water heating units - Other (%)	4.69	2.6	2.57	2.58	2.57	2.54	2.53

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.119	0.138	0.16	0.186	0.216	0.25	0.29
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.29	1.74	2.14	2	1.79	1.66	1.58
Vehicle sales - Light-duty - EV (%)	4.42	6.72	7.55	9.34	11.3	12.8	14.1
Vehicle sales - Light-duty - gasoline (%)	88.8	85	82.5	80.4	78.1	76.3	74.8
Vehicle sales - Light-duty - hybrid (%)	5.29	6.1	7.39	7.93	8.43	8.88	9.17
Vehicle sales - Light-duty - hydrogen FC (%)	0.109	0.367	0.331	0.29	0.285	0.285	0.294
Vehicle sales - Light-duty - other (%)	0.09	0.094	0.09	0.091	0.09	0.088	0.09
Vehicle sales - Medium-duty - diesel (%)	65.2	63.5	61.6	59.6	58	56.5	55.2
Vehicle sales - Medium-duty - EV (%)	0.027	0.105	0.329	0.671	0.895	0.973	0.993
Vehicle sales - Medium-duty - gasoline (%)	34	35.5	37	38.5	39.7	40.8	41.7
Vehicle sales - Medium-duty - hybrid (%)	0.365	0.427	0.496	0.577	0.674	0.793	0.929
Vehicle sales - Medium-duty - hydrogen FC (%)	0.175	0.208	0.242	0.285	0.339	0.409	0.487
Vehicle sales - Medium-duty - other (%)	0.255	0.271	0.298	0.345	0.42	0.528	0.671

Table 60: *REF scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	434	444	452	461	471	489	515
Final energy use - Industry (PJ)	555	597	628	656	683	707	739
Final energy use - Residential (PJ)	511	502	512	530	554	579	605
Final energy use - Transportation (PJ)	1,917	1,833	1,727	1,667	1,682	1,736	1,802

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	65,779	68,382	0	0	0	0
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Sales of space heating units - Electric Heat Pump (%)	23.9	29.3	65.2	72.1	72.1	72.3	72.4
Sales of space heating units - Electric Resistance (%)	22.7	9.78	14.9	20.3	25.2	25.6	25.6
Sales of space heating units - Fossil (%)	0	4.02	2.38	1.17	0.182	0.016	0
Sales of space heating units - Gas Furnace (%)	53.5	56.8	17.5	6.48	2.56	2.06	2.02
Sales of water heating units - Electric Heat Pump (%)	0.849	0.3	0.292	0.292	0.293	0.29	0.29

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	20.9	7.47	7.27	7.29	7.31	7.22	7.19
Sales of water heating units - Gas Furnace (%)	69.5	87.9	88	88	87.9	88	88.1
Sales of water heating units - Other (%)	8.69	4.37	4.46	4.43	4.48	4.48	4.46

Table 62: *REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	8.36	8.08	14.3	14.8	14.9	15.4

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

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-24.6	0	-13.3	-10.8
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-2.53	0	-4.22	-4.44
Business-as-usual carbon sink - Total (Mt CO2e/y)	-27.1	0	-17.5	-15.2
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	1,328
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	38,862
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	3,923
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	6,195
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	3,791
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	9,304
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	983
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	462
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	8,095
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	4,781
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	665
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	11,529
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	654
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	2,380
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	1,929
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	3,101
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	344
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	231
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	0	613
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	1,612
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	997
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	25,162

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

Item	2020	2025	2030	2050
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	0	2,289
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	4,287
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	2,827
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	6,203
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	664
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0	346
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	0	4,354
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	3,196
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	217
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	531
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	3,159
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	1,397
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)	0	0	0	93.4
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0	30.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	0	230
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	1,585
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	7,243
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	109
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	499
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	1,210
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	698
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)	0	0	0	49.2
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0	15.3
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	39.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	959
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	3,579
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	163
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	515

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

Item	2020	2025	2030	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	0	2,185
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	1,051
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)	0	0	0	71.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0	22.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	0	288
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	1,931
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	6,227

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	2,010	1,390	991	866	790	773
Monetary damages from air pollution - Natural Gas (million 2019$)	0	785	831	884	1,027	1,024	985
Monetary damages from air pollution - Transportation (million 2019$)	0	5,924	6,179	6,441	6,746	7,065	7,402
Premature deaths from air pollution - Coal (deaths)	0	226	156	111	97.2	88.6	86.7
Premature deaths from air pollution - Natural Gas (deaths)	0	88.6	93.9	99.9	116	116	111
Premature deaths from air pollution - Transportation (deaths)	0	666	695	724	759	795	832