Net-Zero America - west virginia 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	0.682	0.676	0	0	0	0
Sales of cooking units - Electric Resistance (%)	62.6	70.5	95	99.7	100	100	100
Sales of cooking units - Gas (%)	37.4	29.5	5.04	0.254	0	0	0
Sales of space heating units - Electric Heat Pump (%)	20.6	34.6	64.3	82.8	85.4	85.5	85.5
Sales of space heating units - Electric Resistance (%)	18.3	20.1	12	6.25	5.33	5.36	5.42
Sales of space heating units - Fossil (%)	10.8	15.7	9.07	6.34	6.05	5.96	5.93
Sales of space heating units - Gas (%)	50.2	29.6	14.6	4.64	3.25	3.16	3.14
Sales of water heating units - Electric Heat Pump (%)	0	5.29	30.4	43.3	45	45.1	45.2
Sales of water heating units - Electric Resistance (%)	45	59.7	53.2	53.1	53.2	53.3	53.2
Sales of water heating units - Gas Furnace (%)	52.2	33	14.7	1.99	0.11	0	0
Sales of water heating units - Other (%)	2.8	2.02	1.66	1.59	1.61	1.62	1.64

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	326	832	1,355	2,050	2,233	2,128
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.708	0	3.17	0	5.13
Public EV charging plugs - L2 (1000 units)	0.164	0	17	0	76.1	0	123
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 (%)	1.78	2.02	1.35	0.436	0.079	0.013	0
Vehicle sales - Light-duty - EV (%)	3.13	12.8	42.7	80.3	96.1	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.2	80.7	52.7	18	3.49	0.596	0
Vehicle sales - Light-duty - hybrid (%)	3.66	3.99	2.95	1.12	0.268	0.057	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.353	0.222	0.07	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.112	0.109	0.073	0.026	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	48.6	48.7	47.1	44.5	42	41	41.4
Final energy use - Industry (PJ)	185	197	201	206	212	214	218
Final energy use - Residential (PJ)	38.4	36.1	33.5	30.6	27.6	25.7	24.7
Final energy use - Transportation (PJ)	151	141	123	101	81	68.6	63.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	5,826	6,488	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 (%)	3.31	21.4	54	79.9	84	84.2	84.2
Sales of space heating units - Electric Resistance (%)	3.22	8.3	10.8	13.4	13.9	13.9	13.9
Sales of space heating units - Fossil (%)	4.12	4.08	0.778	0.033	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 (%)	89.4	66.3	34.4	6.61	2.15	1.91	1.9
Sales of water heating units - Electric Heat Pump (%)	0.114	6.44	36.5	54	56.3	56.5	56.5
Sales of water heating units - Electric Resistance (%)	2.92	9.46	24.7	38.5	40.7	40.8	40.8
Sales of water heating units - Gas Furnace (%)	94.5	80.1	35.8	4.81	0.265	0	0
Sales of water heating units - Other (%)	2.43	4.02	2.96	2.7	2.7	2.7	2.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	0.954	0.978	1.95	2.08	1.75	1.83

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)	0	0	0	2.45	5.41	6.37	4.59
Capital invested - Solar PV - Constrained (billion $2018)	0	0	0	1.91	3.94	5.57	3.3
Capital invested - Wind - Base (billion $2018)	0	0	8.36	8.42	14.7	0.853	2.18
Capital invested - Wind - Constrained (billion $2018)	0	0	26.5	33.7	0.092	0	2.31

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Solar - Base land use assumptions (GWh)	0	0	0	3,967	9,289	11,351	8,667
Solar - Constrained land use assumptions (GWh)	0	0	507	3,609	4,703	5,766	4,412
Wind - Base land use assumptions (GWh)	3,100	0	21,919	21,918	37,304	2,135	5,444
Wind - Constrained land use assumptions (GWh)	3,100	0	61,846	70,396	251	0	2,728

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	0	0	0	0	136
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	0	2,949
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	4
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0	0	0	0	7.32
Annual - BECCS (MMT)	0	0	0	0	0	0	3.79
Annual - Cement and lime (MMT)	0	0	0	0	0	0	3.53
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	0	7.32
Cumulative - BECCS (MMT)	0	0	0	0	0	0	3.79
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	3.53
Cumulative - NGCC (MMT)	0	0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	0	0	0	316
Cumulative investment - All (million $2018)	0	0	0	0	0	0	223
Cumulative investment - Spur (million $2018)	0	0	0	0	0	0	223
Cumulative investment - Trunk (million $2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	316
Trunk (km)	0	0	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-518
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-21.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-539
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	-273
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-10.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-284
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	345
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	38.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	384
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	182
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	19.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	201

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	108
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	17,784
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,114
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,750
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	53.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	5,372
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	927
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	80.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	11,577
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,961

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	133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,839
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	17.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	22.3
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	18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	4,415
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	11.2
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	9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	16.8
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	14.3

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	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	3,614

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	444	0.449	0.444	0.407	0.298	0.027
Monetary damages from air pollution - Natural Gas (million 2019$)	0	59.9	42.9	24.9	19.4	10.8	3.95
Monetary damages from air pollution - Transportation (million 2019$)	0	354	313	226	124	53.7	20.3
Premature deaths from air pollution - Coal (deaths)	0	49.9	0.05	0.05	0.046	0.033	0.003
Premature deaths from air pollution - Natural Gas (deaths)	0	6.77	4.84	2.81	2.2	1.21	0.446
Premature deaths from air pollution - Transportation (deaths)	0	39.8	35.2	25.4	13.9	6.04	2.28

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	0	0	0	0	0	0	187
By economic sector - Construction (jobs)	4,139	3,000	4,786	8,330	13,768	13,606	14,092
By economic sector - Manufacturing (jobs)	5,882	8,241	9,292	11,903	11,721	9,648	11,803
By economic sector - Mining (jobs)	15,091	9,227	6,030	4,762	3,441	2,534	1,768
By economic sector - Other (jobs)	195	101	282	883	1,891	2,238	2,476
By economic sector - Pipeline (jobs)	570	576	498	405	305	202	170
By economic sector - Professional (jobs)	4,264	2,755	3,602	5,766	9,371	9,332	9,924
By economic sector - Trade (jobs)	5,408	3,088	2,895	3,916	5,799	5,886	6,180
By economic sector - Utilities (jobs)	6,505	3,826	3,995	5,997	9,625	9,272	10,485
By education level - All sectors - Associates degree or some college (jobs)	12,400	9,180	9,560	13,054	17,709	16,762	18,204
By education level - All sectors - Bachelors degree (jobs)	8,290	6,444	6,702	8,804	11,602	10,887	11,717
By education level - All sectors - Doctoral degree (jobs)	256	190	214	300	439	425	447
By education level - All sectors - High school diploma or less (jobs)	19,169	13,538	13,358	17,727	23,310	21,919	23,800
By education level - All sectors - Masters or professional degree (jobs)	1,939	1,462	1,547	2,077	2,861	2,725	2,918
By resource sector - Biomass (jobs)	0	0	0	0	0	0	800
By resource sector - CO2 (jobs)	0	0	0	0	0	0	414
By resource sector - Coal (jobs)	19,596	9,540	4,431	3,660	3,187	2,872	2,545
By resource sector - Grid (jobs)	5,808	1,781	3,819	8,462	15,816	16,344	19,155
By resource sector - Natural Gas (jobs)	7,319	7,105	5,936	4,650	3,639	2,141	1,247
By resource sector - Nuclear (jobs)	0	0	0	0	0	0	0
By resource sector - Oil (jobs)	7,331	6,960	6,170	5,397	3,868	2,839	1,735
By resource sector - Solar (jobs)	1,064	2,472	2,916	6,844	10,894	12,317	14,313
By resource sector - Wind (jobs)	935	2,956	8,109	12,949	18,516	16,204	16,877
Median wages - Annual - All ($2019 per job)	53,933	54,948	55,705	55,935	56,689	57,386	57,960
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	6,616	4,850	4,991	6,734	9,081	8,574	9,252
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	2,375	1,683	1,810	2,536	3,653	3,504	3,721
On-Site or In-Plant Training - Total jobs - None (jobs)	6,139	4,709	4,981	6,776	9,115	8,609	9,352

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)	279	213	236	335	472	449	488
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	26,645	19,359	19,363	25,582	33,599	31,582	34,271
On-the-Job Training - All sectors - 1 to 4 years (jobs)	8,315	6,120	6,350	8,609	11,691	11,048	11,911
On-the-Job Training - All sectors - 4 to 10 years (jobs)	2,272	1,571	1,705	2,436	3,581	3,455	3,673
On-the-Job Training - All sectors - None (jobs)	2,109	1,577	1,640	2,218	2,997	2,848	3,078
On-the-Job Training - All sectors - Over 10 years (jobs)	338	288	315	428	555	515	558
On-the-Job Training - All sectors - Up to 1 year (jobs)	29,019	21,258	21,372	28,271	37,096	34,853	37,866
Related work experience - All sectors - 1 to 4 years (jobs)	15,812	11,455	11,507	15,228	20,204	19,039	20,539
Related work experience - All sectors - 4 to 10 years (jobs)	9,175	6,894	7,194	9,684	13,032	12,283	13,252
Related work experience - All sectors - None (jobs)	5,664	4,172	4,299	5,820	7,861	7,450	8,105
Related work experience - All sectors - Over 10 years (jobs)	2,510	1,967	2,043	2,704	3,517	3,276	3,557
Related work experience - All sectors - Up to 1 year (jobs)	8,892	6,326	6,338	8,526	11,307	10,670	11,633
Wage income - All (million $2019)	2,268	1,693	1,748	2,347	3,170	3,026	3,309

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	156	158	133	107	80.5	50.6	35.1
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	3,220
Natural gas production - Annual (tcf)	1,807	2,002	1,893	1,648	1,394	1,105	859
Oil consumption - Annual (million bbls)	33	31	26.8	20.4	14.4	9.6	5.68
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	627
Oil production - Annual (million bbls)	13.9	15.1	15.1	15.1	12	9.71	6.46

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.678	0.66	0	0	0	0
Sales of cooking units - Electric Resistance (%)	62.4	63.4	66.8	75.9	88.5	96.3	99
Sales of cooking units - Gas (%)	37.6	36.6	33.2	24.1	11.5	3.71	0.997
Sales of space heating units - Electric Heat Pump (%)	20.6	29.9	33.3	43.4	60.9	75.7	82.6
Sales of space heating units - Electric Resistance (%)	18.3	21.3	20.5	17.4	12.3	8.13	6.18
Sales of space heating units - Fossil (%)	10.8	16.9	16.2	14	10.4	7.61	6.49
Sales of space heating units - Gas (%)	50.2	31.9	30	25.2	16.5	8.57	4.78
Sales of water heating units - Electric Heat Pump (%)	0	1.02	3.88	12.4	26.6	38	43.1
Sales of water heating units - Electric Resistance (%)	45	61.1	60.3	58	54.9	53.5	53.2
Sales of water heating units - Gas Furnace (%)	52.2	35.8	33.7	27.7	16.7	6.76	2.07
Sales of water heating units - Other (%)	2.8	2.09	2.06	1.96	1.8	1.69	1.66

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	52.1	111	373	1,179	1,716
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.211	0	1.17	0	3.29
Public EV charging plugs - L2 (1000 units)	0.164	0	5.06	0	28.1	0	79
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 (%)	1.8	2.17	2.1	1.68	1.1	0.568	0.242
Vehicle sales - Light-duty - EV (%)	1.61	4.08	10.6	23.8	46.1	70.5	87
Vehicle sales - Light-duty - gasoline (%)	92.6	88.6	81.6	69.2	48.7	26.4	11.6
Vehicle sales - Light-duty - hybrid (%)	3.77	4.63	5.26	4.9	3.79	2.31	1.14
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.387	0.34	0.265	0.191	0.108	0.05
Vehicle sales - Light-duty - other (%)	0.113	0.117	0.108	0.095	0.069	0.038	0.018
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)	48.6	48.8	48.2	47.6	46.4	45.3	44.7
Final energy use - Industry (PJ)	185	197	202	207	214	216	219
Final energy use - Residential (PJ)	38.4	36.2	35	33.8	32.2	30.3	28.1
Final energy use - Transportation (PJ)	151	143	129	118	110	100	89.1

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	5,823	6,480	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 (%)	3.31	16.5	20.2	31.4	51.9	70.8	80
Sales of space heating units - Electric Resistance (%)	3.22	7.96	8.26	9.15	10.8	12.6	13.5
Sales of space heating units - Fossil (%)	4.12	4.72	4.38	3.31	1.62	0.515	0.135
Sales of space heating units - Gas Furnace (%)	89.4	70.9	67.2	56.1	35.6	16.1	6.3
Sales of water heating units - Electric Heat Pump (%)	0.114	1.49	4.92	15.1	32.6	47.1	53.7
Sales of water heating units - Electric Resistance (%)	2.92	7.34	9.03	14.3	24.3	33.8	38.6
Sales of water heating units - Gas Furnace (%)	94.5	86.9	81.8	66.8	39.9	16.2	4.96
Sales of water heating units - Other (%)	2.43	4.23	4.21	3.78	3.24	2.87	2.74

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	0.829	0.837	1.16	1.2	1.73	1.83

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	-518
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-21.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-539

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	-273
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-10.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-284
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	345
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	38.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	384
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	182
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	19.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	201

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	108
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	17,784
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,114
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,750
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	53.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	5,372
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	30.8

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	1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	927
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	80.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	11,577
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,839
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	17.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	22.3
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	18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	4,415
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	11.2
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	9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	16.8
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	14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	3,614

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	444	0.449	0.444	0.407	0.298	0.027
Monetary damages from air pollution - Natural Gas (million 2019$)	0	54.8	34.5	13.4	5.22	1.61	0.892
Monetary damages from air pollution - Transportation (million 2019$)	0	359	343	317	271	205	134
Premature deaths from air pollution - Coal (deaths)	0	49.9	0.05	0.05	0.046	0.033	0.003
Premature deaths from air pollution - Natural Gas (deaths)	0	6.19	3.89	1.51	0.589	0.182	0.101
Premature deaths from air pollution - Transportation (deaths)	0	40.4	38.6	35.7	30.5	23.1	15.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.682	0.676	0	0	0	0
Sales of cooking units - Electric Resistance (%)	62.6	70.5	95	99.7	100	100	100
Sales of cooking units - Gas (%)	37.4	29.5	5.04	0.254	0	0	0
Sales of space heating units - Electric Heat Pump (%)	20.6	34.6	64.3	82.8	85.4	85.5	85.5
Sales of space heating units - Electric Resistance (%)	18.3	20.1	12	6.25	5.33	5.36	5.42
Sales of space heating units - Fossil (%)	10.8	15.7	9.07	6.34	6.05	5.96	5.93
Sales of space heating units - Gas (%)	50.2	29.6	14.6	4.64	3.25	3.16	3.14
Sales of water heating units - Electric Heat Pump (%)	0	5.29	30.4	43.3	45	45.1	45.2

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 (%)	45	59.7	53.2	53.1	53.2	53.3	53.2
Sales of water heating units - Gas Furnace (%)	52.2	33	14.7	1.99	0.11	0	0
Sales of water heating units - Other (%)	2.8	2.02	1.66	1.59	1.61	1.62	1.64

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	326	832	1,355	2,050	2,233	2,128
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.708	0	3.17	0	5.13
Public EV charging plugs - L2 (1000 units)	0.164	0	17	0	76.1	0	123
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 (%)	1.78	2.02	1.35	0.436	0.079	0.013	0
Vehicle sales - Light-duty - EV (%)	3.13	12.8	42.7	80.3	96.1	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.2	80.7	52.7	18	3.49	0.596	0
Vehicle sales - Light-duty - hybrid (%)	3.66	3.99	2.95	1.12	0.268	0.057	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.353	0.222	0.07	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.112	0.109	0.073	0.026	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	48.6	48.7	47.1	44.5	42	41	41.4
Final energy use - Industry (PJ)	185	197	201	206	212	214	218
Final energy use - Residential (PJ)	38.4	36.1	33.5	30.6	27.6	25.7	24.7
Final energy use - Transportation (PJ)	151	141	123	101	81	68.6	63.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	5,826	6,488	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 (%)	3.31	21.4	54	79.9	84	84.2	84.2
Sales of space heating units - Electric Resistance (%)	3.22	8.3	10.8	13.4	13.9	13.9	13.9
Sales of space heating units - Fossil (%)	4.12	4.08	0.778	0.033	0	0	0
Sales of space heating units - Gas Furnace (%)	89.4	66.3	34.4	6.61	2.15	1.91	1.9
Sales of water heating units - Electric Heat Pump (%)	0.114	6.44	36.5	54	56.3	56.5	56.5
Sales of water heating units - Electric Resistance (%)	2.92	9.46	24.7	38.5	40.7	40.8	40.8
Sales of water heating units - Gas Furnace (%)	94.5	80.1	35.8	4.81	0.265	0	0
Sales of water heating units - Other (%)	2.43	4.02	2.96	2.7	2.7	2.7	2.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	0.954	0.978	1.95	2.08	1.75	1.83

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	0.106	0.219	7.29	6.45	15.1	0
Capital invested - Wind - Base (billion $2018)	0	0	10.9	16.1	27.2	10.4	0.041

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	0	145	331	11,615	10,872	26,965	0
Solar - Constrained land use assumptions (GWh)	0	689	1,000	6,174	10,975	7,154	331
Wind - Base land use assumptions (GWh)	3,100	0	28,242	40,430	59,551	22,830	87.4
Wind - Constrained land use assumptions (GWh)	3,100	0	82,146	50,348	0	0	49,733

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	-518
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-21.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-539
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	-273
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-10.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-284
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	345
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	38.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	384
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	182
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	19.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	201

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	108
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	17,784
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,114
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,750
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	53.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	5,372
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	927
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	80.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	11,577
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,839
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	17.6

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	98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	22.3
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	18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	4,415
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	11.2
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	9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	16.8
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	14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	3,614

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	444	0.449	0.444	0.407	0.298	0.027
Monetary damages from air pollution - Natural Gas (million 2019$)	0	52.5	36.9	19.5	11.6	3.38	0.844
Monetary damages from air pollution - Transportation (million 2019$)	0	354	313	226	124	53.7	20.3
Premature deaths from air pollution - Coal (deaths)	0	49.9	0.05	0.05	0.046	0.033	0.003
Premature deaths from air pollution - Natural Gas (deaths)	0	5.93	4.17	2.2	1.31	0.382	0.095
Premature deaths from air pollution - Transportation (deaths)	0	39.8	35.2	25.4	13.9	6.04	2.28

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.682	0.676	0	0	0	0
Sales of cooking units - Electric Resistance (%)	62.6	70.5	95	99.7	100	100	100
Sales of cooking units - Gas (%)	37.4	29.5	5.04	0.254	0	0	0
Sales of space heating units - Electric Heat Pump (%)	20.6	34.6	64.3	82.8	85.4	85.5	85.5
Sales of space heating units - Electric Resistance (%)	18.3	20.1	12	6.25	5.33	5.36	5.42
Sales of space heating units - Fossil (%)	10.8	15.7	9.07	6.34	6.05	5.96	5.93
Sales of space heating units - Gas (%)	50.2	29.6	14.6	4.64	3.25	3.16	3.14
Sales of water heating units - Electric Heat Pump (%)	0	5.29	30.4	43.3	45	45.1	45.2
Sales of water heating units - Electric Resistance (%)	45	59.7	53.2	53.1	53.2	53.3	53.2
Sales of water heating units - Gas Furnace (%)	52.2	33	14.7	1.99	0.11	0	0
Sales of water heating units - Other (%)	2.8	2.02	1.66	1.59	1.61	1.62	1.64

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	326	832	1,355	2,050	2,233	2,128
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.708	0	3.17	0	5.13
Public EV charging plugs - L2 (1000 units)	0.164	0	17	0	76.1	0	123
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 (%)	1.78	2.02	1.35	0.436	0.079	0.013	0
Vehicle sales - Light-duty - EV (%)	3.13	12.8	42.7	80.3	96.1	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.2	80.7	52.7	18	3.49	0.596	0
Vehicle sales - Light-duty - hybrid (%)	3.66	3.99	2.95	1.12	0.268	0.057	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.353	0.222	0.07	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.112	0.109	0.073	0.026	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	48.6	48.7	47.1	44.5	42	41	41.4
Final energy use - Industry (PJ)	185	197	201	206	212	214	218
Final energy use - Residential (PJ)	38.4	36.1	33.5	30.6	27.6	25.7	24.7
Final energy use - Transportation (PJ)	151	141	123	101	81	68.6	63.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	5,826	6,488	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 (%)	3.31	21.4	54	79.9	84	84.2	84.2
Sales of space heating units - Electric Resistance (%)	3.22	8.3	10.8	13.4	13.9	13.9	13.9
Sales of space heating units - Fossil (%)	4.12	4.08	0.778	0.033	0	0	0
Sales of space heating units - Gas Furnace (%)	89.4	66.3	34.4	6.61	2.15	1.91	1.9
Sales of water heating units - Electric Heat Pump (%)	0.114	6.44	36.5	54	56.3	56.5	56.5
Sales of water heating units - Electric Resistance (%)	2.92	9.46	24.7	38.5	40.7	40.8	40.8
Sales of water heating units - Gas Furnace (%)	94.5	80.1	35.8	4.81	0.265	0	0
Sales of water heating units - Other (%)	2.43	4.02	2.96	2.7	2.7	2.7	2.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	0.954	0.978	1.95	2.08	1.75	1.83

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion $2018)	0	1.11	3.75	0	0.593	0.045	0.132
Capital invested - Wind - Constrained (billion $2018)	0	2.36	8.13	0	1.61	0.493	0.71

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

Item	2020	2025	2030	2040	2045	2050
Wind - Base land use assumptions (GWh)	3,100	2,823	9,934	1,720	147	415
Wind - Constrained land use assumptions (GWh)	3,100	5,775	20,686	4,421	1,404	2,126

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	-518
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-21.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-539
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	-273
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-10.5
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-284

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

Item	2020	2025	2050
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	345
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	38.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	384
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	182
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	19.2
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	201

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	108
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	17,784
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,114
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,750
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	53.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	5,372
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	236

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

Item	2020	2025	2050
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	927
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	80.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	11,577
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,839
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	17.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	22.3
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	18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	4,415
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	11.2
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	9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	552

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	16.8
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	14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	3,614

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	444	0.449	0.444	0.407	0.298	0.027
Monetary damages from air pollution - Natural Gas (million 2019$)	0	61.9	42.7	60.6	43.8	15.3	4.48
Monetary damages from air pollution - Transportation (million 2019$)	0	354	313	226	124	53.7	20.3
Premature deaths from air pollution - Coal (deaths)	0	49.9	0.05	0.05	0.046	0.033	0.003
Premature deaths from air pollution - Natural Gas (deaths)	0	6.99	4.83	6.84	4.94	1.73	0.506
Premature deaths from air pollution - Transportation (deaths)	0	39.8	35.2	25.4	13.9	6.04	2.28

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.678	0.66	0	0	0	0
Sales of cooking units - Electric Resistance (%)	62.4	63.4	66.8	75.9	88.5	96.3	99
Sales of cooking units - Gas (%)	37.6	36.6	33.2	24.1	11.5	3.71	0.997
Sales of space heating units - Electric Heat Pump (%)	20.6	29.9	33.3	43.4	60.9	75.7	82.6
Sales of space heating units - Electric Resistance (%)	18.3	21.3	20.5	17.4	12.3	8.13	6.18
Sales of space heating units - Fossil (%)	10.8	16.9	16.2	14	10.4	7.61	6.49
Sales of space heating units - Gas (%)	50.2	31.9	30	25.2	16.5	8.57	4.78
Sales of water heating units - Electric Heat Pump (%)	0	1.02	3.88	12.4	26.6	38	43.1
Sales of water heating units - Electric Resistance (%)	45	61.1	60.3	58	54.9	53.5	53.2
Sales of water heating units - Gas Furnace (%)	52.2	35.8	33.7	27.7	16.7	6.76	2.07
Sales of water heating units - Other (%)	2.8	2.09	2.06	1.96	1.8	1.69	1.66

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	52.1	111	373	1,179	1,716
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.211	0	1.17	0	3.29
Public EV charging plugs - L2 (1000 units)	0.164	0	5.06	0	28.1	0	79
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 (%)	1.8	2.17	2.1	1.68	1.1	0.568	0.242
Vehicle sales - Light-duty - EV (%)	1.61	4.08	10.6	23.8	46.1	70.5	87
Vehicle sales - Light-duty - gasoline (%)	92.6	88.6	81.6	69.2	48.7	26.4	11.6
Vehicle sales - Light-duty - hybrid (%)	3.77	4.63	5.26	4.9	3.79	2.31	1.14
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.387	0.34	0.265	0.191	0.108	0.05
Vehicle sales - Light-duty - other (%)	0.113	0.117	0.108	0.095	0.069	0.038	0.018
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)	48.6	48.8	48.2	47.6	46.4	45.3	44.7
Final energy use - Industry (PJ)	185	197	202	207	214	216	219
Final energy use - Residential (PJ)	38.4	36.2	35	33.8	32.2	30.3	28.1
Final energy use - Transportation (PJ)	151	143	129	118	110	100	89.1

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	5,823	6,480	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 (%)	3.31	16.5	20.2	31.4	51.9	70.8	80
Sales of space heating units - Electric Resistance (%)	3.22	7.96	8.26	9.15	10.8	12.6	13.5
Sales of space heating units - Fossil (%)	4.12	4.72	4.38	3.31	1.62	0.515	0.135
Sales of space heating units - Gas Furnace (%)	89.4	70.9	67.2	56.1	35.6	16.1	6.3
Sales of water heating units - Electric Heat Pump (%)	0.114	1.49	4.92	15.1	32.6	47.1	53.7
Sales of water heating units - Electric Resistance (%)	2.92	7.34	9.03	14.3	24.3	33.8	38.6
Sales of water heating units - Gas Furnace (%)	94.5	86.9	81.8	66.8	39.9	16.2	4.96
Sales of water heating units - Other (%)	2.43	4.23	4.21	3.78	3.24	2.87	2.74

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	0.829	0.837	1.16	1.2	1.73	1.83

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)	0	0	0	0	0	0	3.53
Annual - BECCS (MMT)	0	0	0	0	0	0	0
Annual - Cement and lime (MMT)	0	0	0	0	0	0	3.53
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	0	3.53
Cumulative - BECCS (MMT)	0	0	0	0	0	0	0
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	3.53
Cumulative - NGCC (MMT)	0	0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)	0	0	0	0	0	0	30.7
Cumulative investment - All (million $2018)	0	0	0	0	0	0	36
Cumulative investment - Spur (million $2018)	0	0	0	0	0	0	36
Cumulative investment - Trunk (million $2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	0	30.7
Trunk (km)	0	0	0	0	0	0	0

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

Item	2020	2025	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-17
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-509
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	-20.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-546
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-17
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-268
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	-10.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-296
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	6.53
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	838
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	0.058
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	110
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	37.7
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	993
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	6.53
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	179
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	0.058
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	110
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	18.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	314

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	108
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	17,784
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,114
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	2,750
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	53.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	5,372
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	927
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	80.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	11,577
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	1,839
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	17.6

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	98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	22.3
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	18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	4,415
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	11.2
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	9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	95.1
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	16.8
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	14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	3,614

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	0.676	0.631	0	0	0	0
Sales of cooking units - Electric Resistance (%)	62.1	62.1	62.1	62.1	62.1	62.1	62.1
Sales of cooking units - Gas (%)	37.9	37.9	37.9	37.9	37.9	37.9	37.9
Sales of space heating units - Electric Heat Pump (%)	19.1	38.2	38.9	39.9	40.6	41.6	42.9
Sales of space heating units - Electric Resistance (%)	18.7	19	18.9	18.2	17.3	16.5	15
Sales of space heating units - Fossil (%)	11	14.2	11.6	10.1	9.89	9.86	9.99
Sales of space heating units - Gas (%)	51.1	28.6	30.6	31.9	32.2	32.1	32
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	45	61.3	61.3	61	60.7	60.7	60.4
Sales of water heating units - Gas Furnace (%)	52.2	36.6	36.6	36.8	37.1	37.2	37.3
Sales of water heating units - Other (%)	2.8	2.1	2.11	2.14	2.17	2.19	2.21

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 (%)	1.79	2.17	2.23	2.07	1.87	1.75	1.66
Vehicle sales - Light-duty - EV (%)	2.78	4.6	5.28	6.43	7.88	9.28	10.4
Vehicle sales - Light-duty - gasoline (%)	91.5	88.2	86.4	84.9	83	81	79.4
Vehicle sales - Light-duty - hybrid (%)	3.67	4.56	5.61	6.19	6.81	7.49	8.11
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.385	0.36	0.323	0.323	0.325	0.336
Vehicle sales - Light-duty - other (%)	0.113	0.116	0.114	0.114	0.114	0.114	0.117
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)	48.6	49.4	49.9	50.1	50.6	52.1	55
Final energy use - Industry (PJ)	186	200	210	215	221	226	233
Final energy use - Residential (PJ)	38.4	36.3	35.7	35.7	36	36.8	37.6
Final energy use - Transportation (PJ)	151	143	130	122	122	126	130

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	5,743	5,973	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 (%)	3.31	21.2	47.1	68.4	72	72.3	72.3
Sales of space heating units - Electric Resistance (%)	3.22	8.68	12.7	19.9	24.9	25.7	25.8
Sales of space heating units - Fossil (%)	4.12	4.58	3.35	1.41	0.205	0.017	0
Sales of space heating units - Gas Furnace (%)	89.4	65.6	36.9	10.2	2.94	1.96	1.9
Sales of water heating units - Electric Heat Pump (%)	0.114	0.273	0.269	0.271	0.272	0.271	0.272

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 (%)	2.92	6.72	6.66	6.66	6.69	6.67	6.68
Sales of water heating units - Gas Furnace (%)	94.5	88.7	88.7	88.7	88.7	88.7	88.7
Sales of water heating units - Other (%)	2.43	4.27	4.39	4.32	4.36	4.39	4.37

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)	0	0.92	0.94	1.05	1.08	1.2	1.24

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

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-5.21	0	-10.5	-9.4
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.21	0	-2.17	-2.26
Business-as-usual carbon sink - Total (Mt CO2e/y)	-6.42	0	-12.7	-11.7
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	108
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	17,784
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	724
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	6,389
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	60.6
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	4,441
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	197
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	3,114
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	2,750
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	53.9
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	5,372
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	121
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	2,454
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	30.8
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	1,480
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	69.1
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	0	236
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	927
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	80.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	11,577

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	422
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	4,421
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	45.2
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	2,961
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	133
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0	0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	0	1,675
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	1,839
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	17.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	98.1
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	3,258
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	22.3
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	18.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	0	88.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	912
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	4,415
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	8.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	92.1
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	1,248
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	11.2
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	9.87
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	15.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	552
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	1,937
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	13.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	95.1

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	2,253
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	16.8
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	14.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0	0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	0	111
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	1,111
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	3,614

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	1,207	733	666	633	613	568
Monetary damages from air pollution - Natural Gas (million 2019$)	0	47.2	55.1	60.8	58.4	60.2	53.9
Monetary damages from air pollution - Transportation (million 2019$)	0	359	348	338	329	321	313
Premature deaths from air pollution - Coal (deaths)	0	135	82.3	74.7	71	68.8	63.8
Premature deaths from air pollution - Natural Gas (deaths)	0	5.33	6.23	6.87	6.6	6.8	6.09
Premature deaths from air pollution - Transportation (deaths)	0	40.4	39.1	38	37	36.1	35.2