Net-Zero America - wisconsin state report

Larson et al. 2020

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

Notes

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.31	4.14	0	0	0	0
Sales of cooking units - Electric Resistance (%)	51.1	61.5	93.4	99.7	100	100	100
Sales of cooking units - Gas (%)	48.9	38.5	6.59	0.332	0	0	0
Sales of space heating units - Electric Heat Pump (%)	3.66	8.85	32.5	79.5	89.5	90.4	90.3
Sales of space heating units - Electric Resistance (%)	13.4	18.8	15	6.74	4.9	4.78	4.99
Sales of space heating units - Fossil (%)	9.47	16	12.3	6.05	4.79	4.67	4.5
Sales of space heating units - Gas (%)	73.5	56.3	40.2	7.71	0.776	0.203	0.19
Sales of water heating units - Electric Heat Pump (%)	0	0.766	10.6	32.6	37.2	37.5	37.6
Sales of water heating units - Electric Resistance (%)	24.6	40.6	46.1	59	62.1	62.3	62.3
Sales of water heating units - Gas Furnace (%)	75.4	58.6	43.2	8.25	0.653	0.021	0
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.114	0.112	0.112	0.113

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	1,089	2,796	4,523	6,855	7,457	7,112
Public EV charging plugs - DC Fast (1000 units)	0.143	0	2.06	0	9	0	14.5
Public EV charging plugs - L2 (1000 units)	0.459	0	49.6	0	216	0	350
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 (%)	1.58	1.84	1.27	0.407	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.8	14.8	45.9	81.6	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.1	78.4	49.4	16.7	3.32	0.591	0
Vehicle sales - Light-duty - hybrid (%)	4.31	4.46	3.18	1.18	0.288	0.063	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.342	0.206	0.064	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.103	0.099	0.065	0.023	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)	194	191	184	171	157	146	140
Final energy use - Industry (PJ)	516	524	516	503	496	492	490
Final energy use - Residential (PJ)	247	230	215	188	157	132	115
Final energy use - Transportation (PJ)	508	474	413	338	271	230	212

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	19,303	21,086	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	0.938	6.01	29.4	77.8	88.2	89	89.1
Sales of space heating units - Electric Resistance (%)	3.03	3.48	5.44	9.73	10.5	10.6	10.6
Sales of space heating units - Fossil (%)	5.62	2.66	0.503	0.021	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 (%)	90.4	87.9	64.6	12.4	1.3	0.384	0.356
Sales of water heating units - Electric Heat Pump (%)	0.306	1.32	13.9	42.1	48.3	48.8	48.8
Sales of water heating units - Electric Resistance (%)	2.97	4.18	16.6	44.4	50.5	51	51
Sales of water heating units - Gas Furnace (%)	96.6	94.3	69.4	13.2	1.05	0.035	0
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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	3.38	3.48	6.55	7	5.91	6.17

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	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	0.104	1.36	0.29	0	0.356
Capital invested - Solar PV - Constrained (billion $2018)	0	0.719	0.334	1.27	1.13	0.49	0.187
Capital invested - Wind - Base (billion $2018)	0	1.17	2.17	2.36	4.1	6.87	14.1
Capital invested - Wind - Constrained (billion $2018)	0	1.44	3.18	14.1	13	9.68	4.97

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)	830	0	152	2,156	473	0	668
Solar - Constrained land use assumptions (GWh)	788	0	152	663	686	218	351
Wind - Base land use assumptions (GWh)	3,031	2,823	5,534	6,350	11,354	20,096	43,687
Wind - Constrained land use assumptions (GWh)	3,031	1,385	6,515	31,976	39,110	28,200	15,387

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	653	1,824
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	9,964	24,682
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	11	14
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	4
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	11
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	12.8	25.1
Annual - BECCS (MMT)	0	0	0	0	0	12.8	25.1
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	12.8	37.9
Cumulative - BECCS (MMT)	0	0	0	0	0	12.8	37.9
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
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	176	1,528
Cumulative investment - All (million $2018)	0	0	0	0	0	253	1,249
Cumulative investment - Spur (million $2018)	0	0	0	0	0	253	1,249
Cumulative investment - Trunk (million $2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	176	1,528
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	-1,228
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-4,557
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-189
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-5,975
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-1,228
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,397
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-94.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,720
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	479
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	3,259
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	344
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	4,082
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	479

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	1,716
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	172
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	2,367

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	392
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	32,495
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	2,104
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,126
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	912
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	6,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	1,651
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	2,230
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,496
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,219
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	197
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	9,861
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	351
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,121
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	464
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	2,121
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	578
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	1,115
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	492
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,422
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	294
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,170
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	1,227
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,624
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	680
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	4,243

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	1,114
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	1,673
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	2,820
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	64.2
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	285
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,144
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	336
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	157
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	147
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	185
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,398
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,716
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	32.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	267
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,588
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	168
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	82.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	73.7
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	846
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,089
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	48.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	276
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,866
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	253
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	120

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	111
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	231
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,704
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,608

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	458	0.376	0.366	0.321	0.224	0.013
Monetary damages from air pollution - Natural Gas (million 2019$)	0	134	93.8	52.9	42.8	27	12.1
Monetary damages from air pollution - Transportation (million 2019$)	0	1,048	981	749	435	201	81.6
Premature deaths from air pollution - Coal (deaths)	0	51.4	0.042	0.041	0.036	0.025	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	15.1	10.6	5.97	4.84	3.05	1.37
Premature deaths from air pollution - Transportation (deaths)	0	118	110	84.2	49	22.6	9.18

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	1,061	1,079	1,220	1,016	574	900	1,821
By economic sector - Construction (jobs)	4,974	4,987	5,073	6,937	7,464	9,195	14,789
By economic sector - Manufacturing (jobs)	3,786	6,804	7,976	10,231	9,740	8,396	11,665
By economic sector - Mining (jobs)	2,969	2,322	1,587	1,067	687	423	269
By economic sector - Other (jobs)	330	312	344	666	704	906	1,560
By economic sector - Pipeline (jobs)	532	528	452	362	275	213	360
By economic sector - Professional (jobs)	2,918	2,918	2,957	3,558	4,075	6,429	11,532
By economic sector - Trade (jobs)	2,926	2,602	2,258	2,526	2,568	3,366	5,661
By economic sector - Utilities (jobs)	6,446	6,264	5,853	7,176	8,101	10,069	15,287
By education level - All sectors - Associates degree or some college (jobs)	7,728	8,381	8,391	10,424	10,849	12,626	19,752
By education level - All sectors - Bachelors degree (jobs)	5,473	5,788	5,658	6,651	6,822	8,148	12,964
By education level - All sectors - Doctoral degree (jobs)	177	177	172	197	209	293	503
By education level - All sectors - High school diploma or less (jobs)	11,259	12,126	12,188	14,736	14,710	16,816	26,439
By education level - All sectors - Masters or professional degree (jobs)	1,305	1,345	1,309	1,531	1,597	2,015	3,285
By resource sector - Biomass (jobs)	2,765	2,792	2,909	2,325	1,396	3,327	7,932
By resource sector - CO2 (jobs)	0	0	0	0	0	206	1,869
By resource sector - Coal (jobs)	2,134	1,355	369	0	0	0	0
By resource sector - Grid (jobs)	6,757	6,660	6,987	11,146	13,349	16,356	26,106
By resource sector - Natural Gas (jobs)	5,008	5,020	4,379	3,611	3,308	3,575	2,390
By resource sector - Nuclear (jobs)	660	649	508	185	0	0	0
By resource sector - Oil (jobs)	5,682	4,997	4,076	3,041	2,199	1,592	1,166
By resource sector - Solar (jobs)	2,047	2,968	3,291	6,000	5,459	4,772	7,090
By resource sector - Wind (jobs)	890	3,376	5,199	7,231	8,477	10,071	16,390
Median wages - Annual - All ($2019 per job)	60,914	60,691	60,843	61,317	62,867	64,760	65,800
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	4,052	4,344	4,328	5,338	5,538	6,451	10,081
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	1,648	1,677	1,637	2,023	2,147	2,617	4,140
On-Site or In-Plant Training - Total jobs - None (jobs)	4,130	4,470	4,481	5,413	5,519	6,500	10,311

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)	212	228	229	286	299	351	551
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	15,901	17,098	17,044	20,479	20,684	23,980	37,861
On-the-Job Training - All sectors - 1 to 4 years (jobs)	5,157	5,522	5,497	6,802	7,102	8,311	12,985
On-the-Job Training - All sectors - 4 to 10 years (jobs)	1,569	1,592	1,558	1,955	2,095	2,571	4,072
On-the-Job Training - All sectors - None (jobs)	1,430	1,509	1,487	1,775	1,786	2,097	3,347
On-the-Job Training - All sectors - Over 10 years (jobs)	235	270	276	341	343	377	582
On-the-Job Training - All sectors - Up to 1 year (jobs)	17,551	18,925	18,900	22,666	22,862	26,542	41,957
Related work experience - All sectors - 1 to 4 years (jobs)	9,294	9,892	9,793	11,821	12,139	14,288	22,516
Related work experience - All sectors - 4 to 10 years (jobs)	5,884	6,290	6,233	7,587	7,865	9,254	14,555
Related work experience - All sectors - None (jobs)	3,806	4,057	4,045	4,880	4,945	5,772	9,107
Related work experience - All sectors - Over 10 years (jobs)	1,574	1,734	1,737	2,117	2,173	2,482	3,869
Related work experience - All sectors - Up to 1 year (jobs)	5,385	5,845	5,910	7,134	7,065	8,102	12,896
Wage income - All (million $2019)	1,580	1,688	1,687	2,057	2,149	2,584	4,142

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	414	420	354	284	214	135	93.3
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	8,559
Natural gas production - Annual (tcf)	0	0	0	0	0	0	0
Oil consumption - Annual (million bbls)	117	112	99.9	80.7	62.9	48.7	38
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	2,487
Oil production - Annual (million bbls)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.29	4.06	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.9	52.2	56.7	68.5	85	95.2	98.7
Sales of cooking units - Gas (%)	49.1	47.8	43.3	31.5	15	4.84	1.3
Sales of space heating units - Electric Heat Pump (%)	3.66	7.03	8.43	13	23.5	36.7	44.5
Sales of space heating units - Electric Resistance (%)	13.4	19	18.7	17.9	16	13.7	12.5
Sales of space heating units - Fossil (%)	9.47	16.4	16.3	15.5	14	12.3	11.1
Sales of space heating units - Gas (%)	73.5	57.5	56.6	53.6	46.4	37.4	31.9
Sales of water heating units - Electric Heat Pump (%)	0	0.205	0.783	2.7	7.35	13.3	17
Sales of water heating units - Electric Resistance (%)	24.6	40.2	40.4	41.4	44.2	47.7	49.9
Sales of water heating units - Gas Furnace (%)	75.4	59.4	58.7	55.8	48.3	38.9	33
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.115	0.115	0.115	0.115

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	177	370	1,251	3,933	5,731
Public EV charging plugs - DC Fast (1000 units)	0.143	0	0.646	0	3.34	0	9.32
Public EV charging plugs - L2 (1000 units)	0.459	0	15.5	0	80.4	0	224
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 (%)	1.6	2	2.06	1.64	1.05	0.542	0.232
Vehicle sales - Light-duty - EV (%)	1.85	4.59	11.7	25.6	48.1	71.8	87.5
Vehicle sales - Light-duty - gasoline (%)	91.9	87.6	79.9	67	46.6	25.1	11
Vehicle sales - Light-duty - hybrid (%)	4.47	5.28	5.94	5.42	4.08	2.42	1.18
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.381	0.328	0.251	0.179	0.099	0.046
Vehicle sales - Light-duty - other (%)	0.104	0.108	0.098	0.086	0.062	0.034	0.016
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	194	191	186	183	179	175	171
Final energy use - Industry (PJ)	516	524	517	508	504	500	498
Final energy use - Residential (PJ)	247	230	218	208	197	184	171
Final energy use - Transportation (PJ)	509	478	433	396	369	336	297

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	19,301	21,085	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Sales of space heating units - Electric Heat Pump (%)	0.938	4.33	5.66	9.99	20.2	33.1	40.9
Sales of space heating units - Electric Resistance (%)	3.03	3.36	3.47	3.84	4.75	5.92	6.59
Sales of space heating units - Fossil (%)	5.62	3.12	3.01	2.66	2.19	1.88	1.77
Sales of space heating units - Gas Furnace (%)	90.4	89.2	87.9	83.5	72.8	59.1	50.7
Sales of water heating units - Electric Heat Pump (%)	0.306	0.605	1.35	3.8	9.77	17.5	22.2
Sales of water heating units - Electric Resistance (%)	2.97	3.47	4.17	6.6	12.5	20.1	24.7
Sales of water heating units - Gas Furnace (%)	96.6	95.7	94.3	89.4	77.6	62.3	52.9
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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	2.66	2.66	3.62	3.74	5.53	5.85

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	-1,228
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-4,557
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-189
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-5,975

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	-1,228
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,397
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-94.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,720
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	479
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	3,259
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	344
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	4,082
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	479
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	1,716
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	172
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	2,367

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	392
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	32,495
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	2,104
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,126
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	912
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	6,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	1,651
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	2,230
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,496
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,219
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	197
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	9,861
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	351
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,121
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	464

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	2,121
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	578
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	1,115
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	492
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,422
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	294
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,170
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	1,227
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,624
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	680
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	4,243
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	1,114
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	1,673
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	2,820
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	64.2
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	285
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,144
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	336
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	157
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	147
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	185
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,398
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,716
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	32.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	267
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,588
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	168
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	82.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	73.7
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	846
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,089
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	48.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	276
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,866
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	253
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	120
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	231
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,704
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,608

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	458	0.376	0.366	0.321	0.224	0.013
Monetary damages from air pollution - Natural Gas (million 2019$)	0	126	66.4	27.2	12.7	5.01	3.96
Monetary damages from air pollution - Transportation (million 2019$)	0	1,066	1,081	1,057	957	766	529
Premature deaths from air pollution - Coal (deaths)	0	51.4	0.042	0.041	0.036	0.025	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	14.3	7.5	3.08	1.43	0.566	0.448
Premature deaths from air pollution - Transportation (deaths)	0	120	122	119	108	86.2	59.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.31	4.14	0	0	0	0
Sales of cooking units - Electric Resistance (%)	51.1	61.5	93.4	99.7	100	100	100
Sales of cooking units - Gas (%)	48.9	38.5	6.59	0.332	0	0	0
Sales of space heating units - Electric Heat Pump (%)	3.66	8.85	32.5	79.5	89.5	90.4	90.3
Sales of space heating units - Electric Resistance (%)	13.4	18.8	15	6.74	4.9	4.78	4.99
Sales of space heating units - Fossil (%)	9.47	16	12.3	6.05	4.79	4.67	4.5
Sales of space heating units - Gas (%)	73.5	56.3	40.2	7.71	0.776	0.203	0.19
Sales of water heating units - Electric Heat Pump (%)	0	0.766	10.6	32.6	37.2	37.5	37.6

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 (%)	24.6	40.6	46.1	59	62.1	62.3	62.3
Sales of water heating units - Gas Furnace (%)	75.4	58.6	43.2	8.25	0.653	0.021	0
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.114	0.112	0.112	0.113

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	1,089	2,796	4,523	6,855	7,457	7,112
Public EV charging plugs - DC Fast (1000 units)	0.143	0	2.06	0	9	0	14.5
Public EV charging plugs - L2 (1000 units)	0.459	0	49.6	0	216	0	350
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 (%)	1.58	1.84	1.27	0.407	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.8	14.8	45.9	81.6	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.1	78.4	49.4	16.7	3.32	0.591	0
Vehicle sales - Light-duty - hybrid (%)	4.31	4.46	3.18	1.18	0.288	0.063	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.342	0.206	0.064	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.103	0.099	0.065	0.023	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)	194	191	184	171	157	146	140
Final energy use - Industry (PJ)	516	524	516	503	496	492	490
Final energy use - Residential (PJ)	247	230	215	188	157	132	115
Final energy use - Transportation (PJ)	508	474	413	338	271	230	212

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	19,303	21,086	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	0.938	6.01	29.4	77.8	88.2	89	89.1
Sales of space heating units - Electric Resistance (%)	3.03	3.48	5.44	9.73	10.5	10.6	10.6
Sales of space heating units - Fossil (%)	5.62	2.66	0.503	0.021	0	0	0
Sales of space heating units - Gas Furnace (%)	90.4	87.9	64.6	12.4	1.3	0.384	0.356
Sales of water heating units - Electric Heat Pump (%)	0.306	1.32	13.9	42.1	48.3	48.8	48.8
Sales of water heating units - Electric Resistance (%)	2.97	4.18	16.6	44.4	50.5	51	51
Sales of water heating units - Gas Furnace (%)	96.6	94.3	69.4	13.2	1.05	0.035	0
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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	3.38	3.48	6.55	7	5.91	6.17

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)	0	0	0.207	0.28	0.969	0.509	7.33
Capital invested - Wind - Base (billion $2018)	0	1.23	2.48	3.09	9.85	22.7	26.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	830	0	303	444	1,615	903	13,765
Solar - Constrained land use assumptions (GWh)	830	0	682	1,479	552	0	17,705
Wind - Base land use assumptions (GWh)	3,031	2,960	6,304	8,256	27,308	66,670	81,297
Wind - Constrained land use assumptions (GWh)	3,031	1,703	9,238	44,103	50,614	16,719	29,313

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	-1,228
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-4,557
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-189
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-5,975
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-1,228
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,397
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-94.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,720
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	479
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	3,259
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	344
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	4,082
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	479
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	1,716
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	172
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	2,367

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	392
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	32,495
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	2,104
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,126
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	912
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	6,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	1,651
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	2,230
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,496
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,219
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	197
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	9,861
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	351
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,121
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	464
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	2,121
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	578
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	1,115
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	492
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,422
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	294
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,170
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	1,227
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,624
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	680
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	4,243
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	1,114
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	1,673
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	2,820
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	64.2

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	285
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,144
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	336
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	157
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	147
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	185
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,398
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,716
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	32.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	267
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,588
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	168
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	82.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	73.7
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	846
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,089
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	48.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	276
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,866
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	253
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	120
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	231
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,704
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,608

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	458	0.376	0.366	0.321	0.224	0.013
Monetary damages from air pollution - Natural Gas (million 2019$)	0	120	71.9	35	23.8	9.59	3.96
Monetary damages from air pollution - Transportation (million 2019$)	0	1,048	981	749	435	201	81.6
Premature deaths from air pollution - Coal (deaths)	0	51.4	0.042	0.041	0.036	0.025	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	13.5	8.12	3.95	2.69	1.08	0.447
Premature deaths from air pollution - Transportation (deaths)	0	118	110	84.2	49	22.6	9.18

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.31	4.14	0	0	0	0
Sales of cooking units - Electric Resistance (%)	51.1	61.5	93.4	99.7	100	100	100
Sales of cooking units - Gas (%)	48.9	38.5	6.59	0.332	0	0	0
Sales of space heating units - Electric Heat Pump (%)	3.66	8.85	32.5	79.5	89.5	90.4	90.3
Sales of space heating units - Electric Resistance (%)	13.4	18.8	15	6.74	4.9	4.78	4.99
Sales of space heating units - Fossil (%)	9.47	16	12.3	6.05	4.79	4.67	4.5
Sales of space heating units - Gas (%)	73.5	56.3	40.2	7.71	0.776	0.203	0.19
Sales of water heating units - Electric Heat Pump (%)	0	0.766	10.6	32.6	37.2	37.5	37.6
Sales of water heating units - Electric Resistance (%)	24.6	40.6	46.1	59	62.1	62.3	62.3
Sales of water heating units - Gas Furnace (%)	75.4	58.6	43.2	8.25	0.653	0.021	0
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.114	0.112	0.112	0.113

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	1,089	2,796	4,523	6,855	7,457	7,112
Public EV charging plugs - DC Fast (1000 units)	0.143	0	2.06	0	9	0	14.5
Public EV charging plugs - L2 (1000 units)	0.459	0	49.6	0	216	0	350
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 (%)	1.58	1.84	1.27	0.407	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.8	14.8	45.9	81.6	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	90.1	78.4	49.4	16.7	3.32	0.591	0
Vehicle sales - Light-duty - hybrid (%)	4.31	4.46	3.18	1.18	0.288	0.063	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.342	0.206	0.064	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.103	0.099	0.065	0.023	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)	194	191	184	171	157	146	140
Final energy use - Industry (PJ)	516	524	516	503	496	492	490
Final energy use - Residential (PJ)	247	230	215	188	157	132	115
Final energy use - Transportation (PJ)	508	474	413	338	271	230	212

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	19,303	21,086	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	0.938	6.01	29.4	77.8	88.2	89	89.1
Sales of space heating units - Electric Resistance (%)	3.03	3.48	5.44	9.73	10.5	10.6	10.6
Sales of space heating units - Fossil (%)	5.62	2.66	0.503	0.021	0	0	0
Sales of space heating units - Gas Furnace (%)	90.4	87.9	64.6	12.4	1.3	0.384	0.356
Sales of water heating units - Electric Heat Pump (%)	0.306	1.32	13.9	42.1	48.3	48.8	48.8
Sales of water heating units - Electric Resistance (%)	2.97	4.18	16.6	44.4	50.5	51	51
Sales of water heating units - Gas Furnace (%)	96.6	94.3	69.4	13.2	1.05	0.035	0
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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	3.38	3.48	6.55	7	5.91	6.17

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)	0	0	0	0	0	0.075	0
Capital invested - Solar PV - Constrained (billion $2018)	0	0	0	0.095	0.11	0.273	0
Capital invested - Wind - Base (billion $2018)	0	1.09	0.945	0.889	1.06	1.88	0.039
Capital invested - Wind - Constrained (billion $2018)	0	0.324	0.812	2.3	3.78	11.6	0.156

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	830	0	0	0	0	132	0
Solar - Constrained land use assumptions (GWh)	830	0	0	152	184	480	0
Wind - Base land use assumptions (GWh)	3,031	2,650	2,425	2,449	3,011	5,538	118
Wind - Constrained land use assumptions (GWh)	3,031	753	1,998	6,053	10,535	34,013	483

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	-1,228
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-4,557
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-189
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-5,975
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-1,228

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

Item	2020	2025	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,397
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-94.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,720
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	479
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	3,259
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	344
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	4,082
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	479
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	1,716
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	172
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	2,367

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	392
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	32,495
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	2,104
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,126
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	912
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	6,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	1,651
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	2,230
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,496
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,219
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	197
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	9,861
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	351
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,121
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	464
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	2,121

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

Item	2020	2025	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	578
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	1,115
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	492
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,422
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	294
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,170
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	1,227
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,624
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	680
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	4,243
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	1,114
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	1,673
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	2,820
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	64.2
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	285
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,144
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	336
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	157
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	147
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	185
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,398
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,716
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	32.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	267
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,588
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	168
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	82.5

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

Item	2020	2025	2050
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	73.7
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	846
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,089
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	48.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	276
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,866
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	253
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	120
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	231
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,704
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,608

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	458	0.376	0.366	0.321	0.224	0.013
Monetary damages from air pollution - Natural Gas (million 2019$)	0	139	97.1	147	108	38.6	14.8
Monetary damages from air pollution - Transportation (million 2019$)	0	1,048	981	749	435	201	81.6
Premature deaths from air pollution - Coal (deaths)	0	51.4	0.042	0.041	0.036	0.025	0.001
Premature deaths from air pollution - Natural Gas (deaths)	0	15.7	11	16.6	12.2	4.36	1.67
Premature deaths from air pollution - Transportation (deaths)	0	118	110	84.2	49	22.6	9.18

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.29	4.06	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.9	52.2	56.7	68.5	85	95.2	98.7
Sales of cooking units - Gas (%)	49.1	47.8	43.3	31.5	15	4.84	1.3
Sales of space heating units - Electric Heat Pump (%)	3.66	7.03	8.43	13	23.5	36.7	44.5
Sales of space heating units - Electric Resistance (%)	13.4	19	18.7	17.9	16	13.7	12.5
Sales of space heating units - Fossil (%)	9.47	16.4	16.3	15.5	14	12.3	11.1
Sales of space heating units - Gas (%)	73.5	57.5	56.6	53.6	46.4	37.4	31.9
Sales of water heating units - Electric Heat Pump (%)	0	0.205	0.783	2.7	7.35	13.3	17
Sales of water heating units - Electric Resistance (%)	24.6	40.2	40.4	41.4	44.2	47.7	49.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	75.4	59.4	58.7	55.8	48.3	38.9	33
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.115	0.115	0.115	0.115

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	177	370	1,251	3,933	5,731
Public EV charging plugs - DC Fast (1000 units)	0.143	0	0.646	0	3.34	0	9.32
Public EV charging plugs - L2 (1000 units)	0.459	0	15.5	0	80.4	0	224
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 (%)	1.6	2	2.06	1.64	1.05	0.542	0.232
Vehicle sales - Light-duty - EV (%)	1.85	4.59	11.7	25.6	48.1	71.8	87.5
Vehicle sales - Light-duty - gasoline (%)	91.9	87.6	79.9	67	46.6	25.1	11
Vehicle sales - Light-duty - hybrid (%)	4.47	5.28	5.94	5.42	4.08	2.42	1.18
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.381	0.328	0.251	0.179	0.099	0.046
Vehicle sales - Light-duty - other (%)	0.104	0.108	0.098	0.086	0.062	0.034	0.016
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	194	191	186	183	179	175	171
Final energy use - Industry (PJ)	516	524	517	508	504	500	498
Final energy use - Residential (PJ)	247	230	218	208	197	184	171
Final energy use - Transportation (PJ)	509	478	433	396	369	336	297

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	19,301	21,085	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Sales of space heating units - Electric Heat Pump (%)	0.938	4.33	5.66	9.99	20.2	33.1	40.9
Sales of space heating units - Electric Resistance (%)	3.03	3.36	3.47	3.84	4.75	5.92	6.59
Sales of space heating units - Fossil (%)	5.62	3.12	3.01	2.66	2.19	1.88	1.77
Sales of space heating units - Gas Furnace (%)	90.4	89.2	87.9	83.5	72.8	59.1	50.7
Sales of water heating units - Electric Heat Pump (%)	0.306	0.605	1.35	3.8	9.77	17.5	22.2
Sales of water heating units - Electric Resistance (%)	2.97	3.47	4.17	6.6	12.5	20.1	24.7
Sales of water heating units - Gas Furnace (%)	96.6	95.7	94.3	89.4	77.6	62.3	52.9
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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	2.66	2.66	3.62	3.74	5.53	5.85

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	0	0	0	2,034	3,688
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	21,604	18,471
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	25	28
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	16
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	27.8	31.1
Annual - BECCS (MMT)	0	0	0	0	0	27.8	31.1
Annual - Cement and lime (MMT)	0	0	0	0	0	0	0
Annual - NGCC (MMT)	0	0	0	0	0	0	0
Cumulative - All (MMT)	0	0	0	0	0	27.8	58.9
Cumulative - BECCS (MMT)	0	0	0	0	0	27.8	58.9
Cumulative - Cement and lime (MMT)	0	0	0	0	0	0	0
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	583	380
Cumulative investment - All (million $2018)	0	0	0	0	0	928	788
Cumulative investment - Spur (million $2018)	0	0	0	0	0	928	788
Cumulative investment - Trunk (million $2018)	0	0	0	0	0	0	0
Spur (km)	0	0	0	0	0	583	380
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	-1,571
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-4,130
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	-170
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-5,872
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	-1,571
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)	0	0	-2,172
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	-85.2
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-3,828
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	798
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)	0	0	7,286
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	33.6
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	137
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	310
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	8,565
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)	0	0	798
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)	0	0	1,553
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	33.6
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	137
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	155
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	2,677

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	392
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	32,495
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	2,104
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	8,126
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	912
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	6,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	1,651
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	2,230
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	6,496
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	4,219
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	197
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	9,861
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	351
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	3,121
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	464
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	2,121
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	578
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	1,115
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	492
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	1,422
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	294
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,170
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	1,227
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	5,624
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	680
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	4,243
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	1,114
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	1,673
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	3,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	2,820
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	64.2

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	285
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	4,144
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	336
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	157
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	147
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	185
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	1,398
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,716
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	32.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	267
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	1,588
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	168
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	82.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	73.7
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	32
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	846
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,089
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	48.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	276
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	2,866
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	253
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	120
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	111
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	231
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	1,704
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,608

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.19	3.37	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.5	50.5	50.5	50.5	50.5	50.5	50.5
Sales of cooking units - Gas (%)	49.5	49.5	49.5	49.5	49.5	49.5	49.5
Sales of space heating units - Electric Heat Pump (%)	2.81	10.6	10.9	11.5	12	12.6	13.4
Sales of space heating units - Electric Resistance (%)	13.5	18.3	18.1	17.9	17.4	16.8	16.1
Sales of space heating units - Fossil (%)	9.72	15.4	14.9	14.5	14.5	14.6	14.5
Sales of space heating units - Gas (%)	74	55.7	56	56.1	56	56.1	56
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	24.6	40.1	39.9	39.8	39.9	39.7	39.7
Sales of water heating units - Gas Furnace (%)	75.4	59.8	60	60	60	60.1	60.2
Sales of water heating units - Other (%)	0.053	0.114	0.115	0.116	0.115	0.116	0.116

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 (%)	1.59	2	2.19	2.04	1.84	1.71	1.63
Vehicle sales - Light-duty - EV (%)	3.45	5.45	6.22	7.64	9.32	10.8	12
Vehicle sales - Light-duty - gasoline (%)	90.4	86.9	84.8	83	80.9	79	77.4
Vehicle sales - Light-duty - hybrid (%)	4.33	5.18	6.35	6.92	7.49	8.09	8.56
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.378	0.348	0.309	0.307	0.308	0.318
Vehicle sales - Light-duty - other (%)	0.104	0.107	0.104	0.104	0.104	0.103	0.105
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)	193	194	192	189	185	185	190
Final energy use - Industry (PJ)	516	542	554	566	585	606	631
Final energy use - Residential (PJ)	247	231	221	214	209	206	203
Final energy use - Transportation (PJ)	508	478	436	411	410	422	438

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	19,095	19,795	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41	44.2	44.3	44.3	44.3	44.4	44.5
Sales of cooking units - Gas (%)	59	55.8	55.7	55.7	55.7	55.6	55.5
Sales of space heating units - Electric Heat Pump (%)	0.938	11.3	43.3	70.2	74.9	75.5	75.5
Sales of space heating units - Electric Resistance (%)	3.03	4.33	9.16	17.5	23.2	24.1	24.1
Sales of space heating units - Fossil (%)	5.62	2.84	1.46	0.267	0.031	0.001	0
Sales of space heating units - Gas Furnace (%)	90.4	81.6	46.1	12	1.88	0.453	0.355
Sales of water heating units - Electric Heat Pump (%)	0.306	0.343	0.347	0.346	0.34	0.342	0.342

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 (%)	2.97	3.21	3.18	3.19	3.17	3.16	3.16
Sales of water heating units - Gas Furnace (%)	96.6	96.3	96.3	96.3	96.3	96.3	96.3
Sales of water heating units - Other (%)	0.173	0.186	0.186	0.187	0.186	0.187	0.187

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	3.26	3.34	4.1	4.26	3.93	4.03

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

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-24.8	0	-14.9	-13.3
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.73	0	-3.12	-3.24
Business-as-usual carbon sink - Total (Mt CO2e/y)	-26.6	0	-18	-16.5
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	392
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	32,495
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	2,104
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	8,126
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	912
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	6,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	1,651
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	2,230
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	6,496
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	4,219
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	197
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	9,861
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	351
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	3,121
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	464
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	2,121
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	578
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	1,115
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	0	492
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	1,422
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	294
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	21,170

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	1,227
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	5,624
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	680
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	4,243
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	1,114
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0	1,673
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	0	3,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	2,820
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	64.2
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	285
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	4,144
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	336
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	157
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0	147
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	0	185
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	1,398
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	6,716
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	32.1
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	267
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	1,588
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	168
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	82.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0	73.7
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	32
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	846
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	3,089
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	48.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	276

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	2,866
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	253
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	120
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0	111
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	0	231
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	1,704
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	5,608

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	1,523	882	599	491	442	430
Monetary damages from air pollution - Natural Gas (million 2019$)	0	145	141	186	144	123	110
Monetary damages from air pollution - Transportation (million 2019$)	0	1,065	1,095	1,126	1,163	1,201	1,239
Premature deaths from air pollution - Coal (deaths)	0	171	99	67.2	55.1	49.6	48.2
Premature deaths from air pollution - Natural Gas (deaths)	0	16.4	15.9	21.1	16.2	13.9	12.5
Premature deaths from air pollution - Transportation (deaths)	0	120	123	127	131	135	139