Net-Zero America - idaho 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	1.25	1.37	0	0	0	0
Sales of cooking units - Electric Resistance (%)	61.7	69.9	94.8	99.7	100	100	100
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Sales of space heating units - Electric Heat Pump (%)	9.46	20.4	40.3	80.7	88.3	89	88.8
Sales of space heating units - Electric Resistance (%)	10.7	17	13.5	5.83	4.48	4.43	4.48
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of water heating units - Electric Heat Pump (%)	0	0.814	11.1	33.7	37.7	38	38
Sales of water heating units - Electric Resistance (%)	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Sales of water heating units - Gas Furnace (%)	76.7	60.4	43.6	6.97	0.411	0	0
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1

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	361	924	1,498	2,269	2,469	2,354
Public EV charging plugs - DC Fast (1000 units)	0.066	0	0.688	0	3.02	0	4.88
Public EV charging plugs - L2 (1000 units)	0.128	0	16.6	0	72.7	0	118
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 (%)	1.91	2.13	1.41	0.454	0.081	0.013	0
Vehicle sales - Light-duty - EV (%)	2.71	11.5	40.7	79.5	96	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.9	82.2	54.8	18.9	3.6	0.6	0
Vehicle sales - Light-duty - hybrid (%)	3.24	3.69	2.8	1.08	0.255	0.053	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.36	0.233	0.074	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.118	0.114	0.079	0.028	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)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8

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	4,239	4,716	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Sales of space heating units - Electric Resistance (%)	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	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 (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of water heating units - Electric Heat Pump (%)	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Sales of water heating units - Gas Furnace (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383

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	1.28	1.35	2.22	2.38	2.18	2.3

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	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)	0	0.002	0	0	0	0	0
Capital invested - Wind - Base (billion $2018)	0	0	17.1	6.28	5.04	5.17	0.609
Capital invested - Wind - Constrained (billion $2018)	0	0	14.8	7.01	7.45	5.78	0.297

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)	4.27	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	3,041	0	38,530	14,351	11,517	12,398	1,517
Wind - Constrained land use assumptions (GWh)	3,306	0	34,477	14,575	15,964	12,081	476

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	55.2
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	0	871
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	3
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	1.08

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - BECCS (MMT)	0	0	0	0	0	0	1.08
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	0	1.08
Cumulative - BECCS (MMT)	0	0	0	0	0	0	1.08
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	177	177	177	508
Cumulative investment - All (million $2018)	0	0	0	423	423	423	606
Cumulative investment - Spur (million $2018)	0	0	0	0	0	0	183
Cumulative investment - Trunk (million $2018)	0	0	0	423	423	423	423
Spur (km)	0	0	0	0	0	0	332
Trunk (km)	0	0	0	177	177	177	177

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	-1,914
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,976
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	-972
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,003
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	2,284
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	104
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	2,387
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	1,168
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,220

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	4,423
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	31,032
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,080
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	6,761
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	2,216
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	2,279
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	3,320
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,253
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,839

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	548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	4,520
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	107
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	77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,113
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	53.5
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	40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	80.5
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	58.9

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	295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,565

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	42.5	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Natural Gas (million 2019$)	0	12.5	7.09	5.76	5.23	3.45	1.91
Monetary damages from air pollution - Transportation (million 2019$)	0	125	120	93.3	54.7	25	9.4
Premature deaths from air pollution - Coal (deaths)	0	4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Natural Gas (deaths)	0	1.41	0.8	0.651	0.591	0.39	0.216
Premature deaths from air pollution - Transportation (deaths)	0	14.1	13.5	10.5	6.15	2.81	1.06

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)	137	143	185	130	77.8	26	66.9
By economic sector - Construction (jobs)	2,854	2,221	7,427	8,396	8,720	9,256	9,387
By economic sector - Manufacturing (jobs)	1,288	1,309	2,451	2,881	2,696	2,467	2,658
By economic sector - Mining (jobs)	731	581	414	265	155	83.3	39.4
By economic sector - Other (jobs)	383	267	741	905	1,047	1,208	1,521
By economic sector - Pipeline (jobs)	126	123	105	133	58.9	37.3	51.3
By economic sector - Professional (jobs)	1,196	1,077	4,833	5,675	6,291	7,026	7,209
By economic sector - Trade (jobs)	973	828	2,548	3,001	3,366	3,831	4,122
By economic sector - Utilities (jobs)	1,314	1,550	5,647	6,258	6,471	7,088	6,824
By education level - All sectors - Associates degree or some college (jobs)	2,749	2,479	7,748	8,866	9,295	10,016	10,294
By education level - All sectors - Bachelors degree (jobs)	1,845	1,682	5,081	5,777	6,080	6,583	6,749
By education level - All sectors - Doctoral degree (jobs)	68.3	60.1	214	246	266	293	302
By education level - All sectors - High school diploma or less (jobs)	3,898	3,471	9,990	11,249	11,637	12,374	12,734
By education level - All sectors - Masters or professional degree (jobs)	443	406	1,318	1,506	1,605	1,756	1,800
By resource sector - Biomass (jobs)	392	413	459	309	198	99.6	303
By resource sector - CO2 (jobs)	0	0	0	419	0	0	236
By resource sector - Coal (jobs)	3.17	2.46	0.823	0	0	0	0
By resource sector - Grid (jobs)	1,302	1,910	9,465	10,247	11,504	12,808	12,127
By resource sector - Natural Gas (jobs)	1,004	922	775	780	569	462	473
By resource sector - Nuclear (jobs)	308	303	298	173	0	0	0
By resource sector - Oil (jobs)	1,661	1,419	1,118	783	500	302	151
By resource sector - Solar (jobs)	3,603	2,066	2,102	2,734	2,943	3,155	5,306
By resource sector - Wind (jobs)	730	1,063	10,133	12,199	13,170	14,195	13,283
Median wages - Annual - All ($2019 per job)	53,347	54,810	56,192	56,868	57,799	58,888	59,480
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)	1,444	1,297	3,998	4,551	4,755	5,112	5,233
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)	606	535	1,754	2,002	2,100	2,271	2,311
On-Site or In-Plant Training - Total jobs - None (jobs)	1,486	1,324	4,005	4,560	4,772	5,130	5,291

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)	73.2	66.7	218	250	262	282	288
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)	5,394	4,876	14,376	16,282	16,994	18,226	18,755
On-the-Job Training - All sectors - 1 to 4 years (jobs)	1,850	1,661	5,196	5,925	6,197	6,671	6,820
On-the-Job Training - All sectors - 4 to 10 years (jobs)	591	519	1,741	1,991	2,093	2,266	2,308
On-the-Job Training - All sectors - None (jobs)	516	454	1,325	1,502	1,571	1,690	1,752
On-the-Job Training - All sectors - Over 10 years (jobs)	94.7	81.6	233	265	272	287	296
On-the-Job Training - All sectors - Up to 1 year (jobs)	5,952	5,383	15,856	17,962	18,751	20,108	20,703
Related work experience - All sectors - 1 to 4 years (jobs)	3,208	2,897	8,751	9,935	10,405	11,205	11,506
Related work experience - All sectors - 4 to 10 years (jobs)	2,064	1,863	5,764	6,570	6,883	7,418	7,590
Related work experience - All sectors - None (jobs)	1,295	1,167	3,475	3,942	4,113	4,416	4,553
Related work experience - All sectors - Over 10 years (jobs)	548	499	1,494	1,699	1,772	1,901	1,944
Related work experience - All sectors - Up to 1 year (jobs)	1,889	1,673	4,867	5,498	5,710	6,082	6,286
Wage income - All (million $2019)	480	444	1,368	1,572	1,670	1,827	1,896

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)	85.2	86.5	72.9	58.5	44	27.7	19.2
Natural gas consumption - Cumulative (tcf)	0	0	0	0	0	0	1,761
Natural gas production - Annual (tcf)	1.92	2.13	2.02	1.76	1.48	1.18	0.915
Oil consumption - Annual (million bbls)	33.9	31.7	27.2	20.5	14.1	9.1	4.81
Oil consumption - Cumulative (million bbls)	0	0	0	0	0	0	629
Oil production - Annual (million bbls)	0.105	0.114	0.114	0.114	0.091	0.074	0.049

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	1.25	1.37	0	0	0	0
Sales of cooking units - Electric Resistance (%)	61.6	62.6	66.1	75.4	88.3	96.2	99
Sales of cooking units - Gas (%)	38.4	37.4	33.9	24.6	11.7	3.79	1.02
Sales of space heating units - Electric Heat Pump (%)	9.46	19.2	21.1	27.7	43.3	62.6	73.4
Sales of space heating units - Electric Resistance (%)	10.7	17.2	16.8	15.7	12.9	9.42	7.34
Sales of space heating units - Fossil (%)	6.36	10.7	10.8	9.99	8.15	6.52	6.16
Sales of space heating units - Gas (%)	73.4	53	51.3	46.6	35.6	21.5	13.1
Sales of water heating units - Electric Heat Pump (%)	0	0.373	1.39	4.79	13	23.4	29.5
Sales of water heating units - Electric Resistance (%)	21.3	36.4	37.1	39.3	44.4	50.9	54.7
Sales of water heating units - Gas Furnace (%)	76.7	61.1	59.4	53.8	40.4	23.6	13.6
Sales of water heating units - Other (%)	1.97	2.1	2.1	2.11	2.11	2.11	2.11

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	58.3	123	414	1,303	1,898
Public EV charging plugs - DC Fast (1000 units)	0.066	0	0.213	0	1.12	0	3.13
Public EV charging plugs - L2 (1000 units)	0.128	0	5.12	0	27	0	75.3
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 (%)	1.92	2.27	2.13	1.71	1.13	0.586	0.249
Vehicle sales - Light-duty - EV (%)	1.46	3.76	9.89	22.7	44.8	69.7	86.6
Vehicle sales - Light-duty - gasoline (%)	93	89.2	82.7	70.7	50.2	27.4	11.9
Vehicle sales - Light-duty - hybrid (%)	3.34	4.23	4.82	4.56	3.59	2.23	1.12
Vehicle sales - Light-duty - hydrogen FC (%)	0.114	0.391	0.348	0.273	0.2	0.113	0.052
Vehicle sales - Light-duty - other (%)	0.119	0.122	0.114	0.1	0.074	0.041	0.019
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)	49	49.1	48.9	48.7	48	47.1	46.1
Final energy use - Industry (PJ)	165	176	181	184	188	193	197
Final energy use - Residential (PJ)	71.3	68.1	66.1	64.1	61.5	57.8	53.1
Final energy use - Transportation (PJ)	150	142	130	120	112	103	93

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	4,239	4,714	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41.9	46.2	50.2	60.8	75.4	84.6	87.8
Sales of cooking units - Gas (%)	58.1	53.8	49.8	39.2	24.6	15.4	12.2
Sales of space heating units - Electric Heat Pump (%)	3.53	7.33	9.61	17.1	35.2	58.2	71.6
Sales of space heating units - Electric Resistance (%)	3.3	3.45	3.58	4.06	5.22	6.69	7.54
Sales of space heating units - Fossil (%)	1.07	0.256	0.242	0.19	0.113	0.063	0.046
Sales of space heating units - Gas Furnace (%)	92.1	89	86.6	78.7	59.5	35.1	20.8
Sales of water heating units - Electric Heat Pump (%)	0.03	0.512	1.83	6.23	16.9	30.4	38.3
Sales of water heating units - Electric Resistance (%)	1.46	1.95	3.27	7.65	18.2	31.6	39.5
Sales of water heating units - Gas Furnace (%)	98.1	97.2	94.5	85.7	64.5	37.6	21.8
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383

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	1.09	1.13	1.39	1.45	2.09	2.22

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	-1,914
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,976

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	-972
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,003
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	2,284
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	104
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	2,387
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	1,168
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,220

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

Item	2020	2025	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	4,423
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	31,032
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,080
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	6,761
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	2,216
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	148

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	1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	2,279
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	3,320
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,253
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	4,520
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	107
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	77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,113
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	53.5
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	40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	80.5
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	58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,565

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	42.5	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Natural Gas (million 2019$)	0	13	6.27	4.16	2.62	1.48	1.11
Monetary damages from air pollution - Transportation (million 2019$)	0	127	131	131	120	97	67.5
Premature deaths from air pollution - Coal (deaths)	0	4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Natural Gas (deaths)	0	1.47	0.708	0.47	0.295	0.168	0.125
Premature deaths from air pollution - Transportation (deaths)	0	14.3	14.8	14.7	13.5	10.9	7.6

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	1.25	1.37	0	0	0	0
Sales of cooking units - Electric Resistance (%)	61.7	69.9	94.8	99.7	100	100	100
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Sales of space heating units - Electric Heat Pump (%)	9.46	20.4	40.3	80.7	88.3	89	88.8
Sales of space heating units - Electric Resistance (%)	10.7	17	13.5	5.83	4.48	4.43	4.48
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of water heating units - Electric Heat Pump (%)	0	0.814	11.1	33.7	37.7	38	38

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 (%)	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Sales of water heating units - Gas Furnace (%)	76.7	60.4	43.6	6.97	0.411	0	0
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1

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	361	924	1,498	2,269	2,469	2,354
Public EV charging plugs - DC Fast (1000 units)	0.066	0	0.688	0	3.02	0	4.88
Public EV charging plugs - L2 (1000 units)	0.128	0	16.6	0	72.7	0	118
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 (%)	1.91	2.13	1.41	0.454	0.081	0.013	0
Vehicle sales - Light-duty - EV (%)	2.71	11.5	40.7	79.5	96	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.9	82.2	54.8	18.9	3.6	0.6	0
Vehicle sales - Light-duty - hybrid (%)	3.24	3.69	2.8	1.08	0.255	0.053	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.36	0.233	0.074	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.118	0.114	0.079	0.028	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)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8

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	4,239	4,716	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Sales of space heating units - Electric Resistance (%)	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	0	0	0
Sales of space heating units - Gas Furnace (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of water heating units - Electric Heat Pump (%)	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Sales of water heating units - Gas Furnace (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383

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	1.28	1.35	2.22	2.38	2.18	2.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion $2018)	0	0	17.8	9.95	14.3	8.47	14.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	4.27	0	0	0	0	0	11,705
Wind - Base land use assumptions (GWh)	3,041	0	39,970	22,284	32,360	19,424	32,982
Wind - Constrained land use assumptions (GWh)	4,217	0	34,889	24,998	23,075	13,321	34,399

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	-1,914
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,976
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	-972
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,003
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	2,284
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	104
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	2,387
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	1,168
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,220

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	4,423
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	31,032
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,080
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	6,761
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	2,216
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	2,279
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	3,320
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,253
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	4,520
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	724

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	107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	107
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	77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,113
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	53.5
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	40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	80.5
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	58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,565

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	42.5	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Natural Gas (million 2019$)	0	11.3	5.84	3.22	2.52	1.5	0.778
Monetary damages from air pollution - Transportation (million 2019$)	0	125	120	93.3	54.7	25	9.4
Premature deaths from air pollution - Coal (deaths)	0	4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Natural Gas (deaths)	0	1.28	0.659	0.364	0.285	0.169	0.088
Premature deaths from air pollution - Transportation (deaths)	0	14.1	13.5	10.5	6.15	2.81	1.06

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	1.25	1.37	0	0	0	0
Sales of cooking units - Electric Resistance (%)	61.7	69.9	94.8	99.7	100	100	100
Sales of cooking units - Gas (%)	38.3	30.1	5.15	0.259	0	0	0
Sales of space heating units - Electric Heat Pump (%)	9.46	20.4	40.3	80.7	88.3	89	88.8
Sales of space heating units - Electric Resistance (%)	10.7	17	13.5	5.83	4.48	4.43	4.48
Sales of space heating units - Fossil (%)	6.36	10.6	9.29	6.2	5.2	4.89	5.13
Sales of space heating units - Gas (%)	73.4	52.1	37	7.24	1.97	1.65	1.64
Sales of water heating units - Electric Heat Pump (%)	0	0.814	11.1	33.7	37.7	38	38
Sales of water heating units - Electric Resistance (%)	21.3	36.7	43.2	57.2	59.8	59.9	59.9
Sales of water heating units - Gas Furnace (%)	76.7	60.4	43.6	6.97	0.411	0	0
Sales of water heating units - Other (%)	1.97	2.09	2.1	2.1	2.1	2.1	2.1

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	361	924	1,498	2,269	2,469	2,354
Public EV charging plugs - DC Fast (1000 units)	0.066	0	0.688	0	3.02	0	4.88
Public EV charging plugs - L2 (1000 units)	0.128	0	16.6	0	72.7	0	118
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 (%)	1.91	2.13	1.41	0.454	0.081	0.013	0
Vehicle sales - Light-duty - EV (%)	2.71	11.5	40.7	79.5	96	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.9	82.2	54.8	18.9	3.6	0.6	0
Vehicle sales - Light-duty - hybrid (%)	3.24	3.69	2.8	1.08	0.255	0.053	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.36	0.233	0.074	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.118	0.114	0.079	0.028	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)	49	49.1	48.2	46	43.3	41.4	40.7
Final energy use - Industry (PJ)	165	175	179	179	180	185	191
Final energy use - Residential (PJ)	71.3	68.1	65.2	58.8	51.1	45.3	41.4
Final energy use - Transportation (PJ)	150	141	124	104	85.9	74.5	69.8

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	4,239	4,716	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Sales of space heating units - Electric Heat Pump (%)	3.53	8.34	31.3	81.3	90.2	90.7	90.8
Sales of space heating units - Electric Resistance (%)	3.3	3.52	4.98	8.12	8.7	8.74	8.73
Sales of space heating units - Fossil (%)	1.07	0.221	0.042	0.002	0	0	0
Sales of space heating units - Gas Furnace (%)	92.1	87.9	63.7	10.6	1.11	0.511	0.508
Sales of water heating units - Electric Heat Pump (%)	0.03	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	1.46	2.52	15.8	44.9	50.1	50.4	50.4
Sales of water heating units - Gas Furnace (%)	98.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383

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	1.28	1.35	2.22	2.38	2.18	2.3

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	0
Capital invested - Solar PV - Constrained (billion $2018)	0	0	0	0	0	0.217	0.57
Capital invested - Wind - Base (billion $2018)	0	1.28	11	4.77	6.07	2.13	0
Capital invested - Wind - Constrained (billion $2018)	0	1.72	11.5	2.37	7.03	3.43	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4.27	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	4.27	0	0	0	0	466	1,304
Wind - Base land use assumptions (GWh)	3,041	2,770	25,082	11,152	14,536	5,157	0
Wind - Constrained land use assumptions (GWh)	4,217	3,660	24,834	5,165	15,737	7,661	0

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	-1,914
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,976
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)	0	0	0

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	-972
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)	0	0	-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,003
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	2,284
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	104
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	2,387
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	1,168
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,220

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	4,423
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	31,032
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,080
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	6,761
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	2,216
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	1,420

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	284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	2,279
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	3,320
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,253
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	4,520
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	107
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	77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,113
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	53.5
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	40.6

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	197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	80.5
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	58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,565

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	42.5	0.049	0.049	0.042	0.027	0
Monetary damages from air pollution - Natural Gas (million 2019$)	0	12.8	6.81	7.03	8.14	4.25	1.34
Monetary damages from air pollution - Transportation (million 2019$)	0	125	120	93.3	54.7	25	9.4
Premature deaths from air pollution - Coal (deaths)	0	4.77	0.005	0.005	0.005	0.003	0
Premature deaths from air pollution - Natural Gas (deaths)	0	1.45	0.77	0.794	0.919	0.48	0.151
Premature deaths from air pollution - Transportation (deaths)	0	14.1	13.5	10.5	6.15	2.81	1.06

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	1.25	1.37	0	0	0	0
Sales of cooking units - Electric Resistance (%)	61.6	62.6	66.1	75.4	88.3	96.2	99
Sales of cooking units - Gas (%)	38.4	37.4	33.9	24.6	11.7	3.79	1.02
Sales of space heating units - Electric Heat Pump (%)	9.46	19.2	21.1	27.7	43.3	62.6	73.4
Sales of space heating units - Electric Resistance (%)	10.7	17.2	16.8	15.7	12.9	9.42	7.34
Sales of space heating units - Fossil (%)	6.36	10.7	10.8	9.99	8.15	6.52	6.16
Sales of space heating units - Gas (%)	73.4	53	51.3	46.6	35.6	21.5	13.1
Sales of water heating units - Electric Heat Pump (%)	0	0.373	1.39	4.79	13	23.4	29.5
Sales of water heating units - Electric Resistance (%)	21.3	36.4	37.1	39.3	44.4	50.9	54.7

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 (%)	76.7	61.1	59.4	53.8	40.4	23.6	13.6
Sales of water heating units - Other (%)	1.97	2.1	2.1	2.11	2.11	2.11	2.11

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	58.3	123	414	1,303	1,898
Public EV charging plugs - DC Fast (1000 units)	0.066	0	0.213	0	1.12	0	3.13
Public EV charging plugs - L2 (1000 units)	0.128	0	5.12	0	27	0	75.3
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 (%)	1.92	2.27	2.13	1.71	1.13	0.586	0.249
Vehicle sales - Light-duty - EV (%)	1.46	3.76	9.89	22.7	44.8	69.7	86.6
Vehicle sales - Light-duty - gasoline (%)	93	89.2	82.7	70.7	50.2	27.4	11.9
Vehicle sales - Light-duty - hybrid (%)	3.34	4.23	4.82	4.56	3.59	2.23	1.12
Vehicle sales - Light-duty - hydrogen FC (%)	0.114	0.391	0.348	0.273	0.2	0.113	0.052
Vehicle sales - Light-duty - other (%)	0.119	0.122	0.114	0.1	0.074	0.041	0.019
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)	49	49.1	48.9	48.7	48	47.1	46.1
Final energy use - Industry (PJ)	165	176	181	184	188	193	197
Final energy use - Residential (PJ)	71.3	68.1	66.1	64.1	61.5	57.8	53.1
Final energy use - Transportation (PJ)	150	142	130	120	112	103	93

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	4,239	4,714	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41.9	46.2	50.2	60.8	75.4	84.6	87.8
Sales of cooking units - Gas (%)	58.1	53.8	49.8	39.2	24.6	15.4	12.2
Sales of space heating units - Electric Heat Pump (%)	3.53	7.33	9.61	17.1	35.2	58.2	71.6
Sales of space heating units - Electric Resistance (%)	3.3	3.45	3.58	4.06	5.22	6.69	7.54
Sales of space heating units - Fossil (%)	1.07	0.256	0.242	0.19	0.113	0.063	0.046
Sales of space heating units - Gas Furnace (%)	92.1	89	86.6	78.7	59.5	35.1	20.8
Sales of water heating units - Electric Heat Pump (%)	0.03	0.512	1.83	6.23	16.9	30.4	38.3
Sales of water heating units - Electric Resistance (%)	1.46	1.95	3.27	7.65	18.2	31.6	39.5
Sales of water heating units - Gas Furnace (%)	98.1	97.2	94.5	85.7	64.5	37.6	21.8
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383

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	1.09	1.13	1.39	1.45	2.09	2.22

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	0.041
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0.096

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	40.5
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	107

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	78.2
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	0	0	1,084
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	2
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	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	1
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	1.16
Annual - BECCS (MMT)	0	0	0	0	0	0	1.16
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	0	1.16
Cumulative - BECCS (MMT)	0	0	0	0	0	0	1.16
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	177	177	177	439
Cumulative investment - All (million $2018)	0	0	0	423	423	423	573
Cumulative investment - Spur (million $2018)	0	0	0	0	0	0	150
Cumulative investment - Trunk (million $2018)	0	0	0	423	423	423	423
Spur (km)	0	0	0	0	0	0	262
Trunk (km)	0	0	0	177	177	177	177

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	0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)	0	0	-1,913
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	-62.8
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)	0	0	-1,976
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	-972
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	-31.4
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)	0	0	-1,003
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	5,638
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)	0	0	0.25
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)	0	0	4.37
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)	0	0	104
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)	0	0	5,746
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	1,168
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)	0	0	0.25
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)	0	0	4.37
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)	0	0	51.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)	0	0	1,224

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	4,423
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	31,032
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	3,080
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	6,761
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	2,216
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	11,479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	2,279
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	3,320
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	21,253
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)	0	0	463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	4,520
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	724

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	107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	107
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	77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	6,113
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	53.5
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	40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	104
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)	0	0	1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	80.5
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	58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	5,565

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	1.22	1.24	0	0	0	0
Sales of cooking units - Electric Resistance (%)	61.2	61.2	61.2	61.2	61.2	61.2	61.2
Sales of cooking units - Gas (%)	38.8	38.8	38.8	38.8	38.8	38.8	38.8
Sales of space heating units - Electric Heat Pump (%)	8.94	22	22.3	22.8	23.5	24.2	24.8
Sales of space heating units - Electric Resistance (%)	10.9	16.6	16.4	16.3	16.1	15.6	14.8
Sales of space heating units - Fossil (%)	6.39	10.3	10.4	10.2	9.34	8.82	9.31
Sales of space heating units - Gas (%)	73.8	51.2	50.9	50.7	51.1	51.4	51
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	21.3	36.2	36.3	36.3	36.4	36.4	36.5
Sales of water heating units - Gas Furnace (%)	76.7	61.7	61.6	61.6	61.5	61.4	61.4
Sales of water heating units - Other (%)	1.97	2.1	2.11	2.11	2.12	2.12	2.12

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 (%)	1.92	2.27	2.25	2.09	1.9	1.77	1.69
Vehicle sales - Light-duty - EV (%)	2.37	4.07	4.67	5.64	6.94	8.25	9.35
Vehicle sales - Light-duty - gasoline (%)	92.2	89	87.5	86.1	84.4	82.4	80.7
Vehicle sales - Light-duty - hybrid (%)	3.26	4.17	5.13	5.71	6.36	7.09	7.8
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.39	0.367	0.332	0.333	0.337	0.348
Vehicle sales - Light-duty - other (%)	0.118	0.122	0.12	0.121	0.121	0.121	0.124
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)	49	50.1	51.1	51.5	51.9	53.3	55.8
Final energy use - Industry (PJ)	165	182	194	206	220	239	257
Final energy use - Residential (PJ)	71.3	68.6	67.8	67.5	68	68.9	69.7
Final energy use - Transportation (PJ)	150	142	131	124	124	127	132

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	4,185	4,377	0	0	0	0
Sales of cooking units - Electric Resistance (%)	41.9	44.7	44.7	44.6	44.4	44.5	44.6
Sales of cooking units - Gas (%)	58.1	55.3	55.3	55.4	55.6	55.5	55.4
Sales of space heating units - Electric Heat Pump (%)	3.53	14.1	47	73.9	78.3	78.8	78.8
Sales of space heating units - Electric Resistance (%)	3.3	4.34	8.76	15.7	20	20.6	20.7
Sales of space heating units - Fossil (%)	1.07	0.24	0.141	0.039	0.005	0	0
Sales of space heating units - Gas Furnace (%)	92.1	81.3	44.1	10.4	1.72	0.57	0.509
Sales of water heating units - Electric Heat Pump (%)	0.03	0.03	0.03	0.03	0.03	0.03	0.03

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 (%)	1.46	1.47	1.47	1.48	1.47	1.48	1.47
Sales of water heating units - Gas Furnace (%)	98.1	98.1	98.1	98.1	98.1	98.1	98.1
Sales of water heating units - Other (%)	0.366	0.384	0.383	0.384	0.383	0.384	0.383

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	1.18	1.23	1.36	1.42	1.52	1.58

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

Item	2020	2025	2030	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-22	0	4.29	1.23
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.16	0	-2.41	-2.53
Business-as-usual carbon sink - Total (Mt CO2e/y)	-23.1	0	1.88	-1.3
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)	0	0	0	4,423
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)	0	0	0	31,032
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)	0	0	0	793
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)	0	0	0	4,659
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)	0	0	0	290
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)	0	0	0	4,259
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)	0	0	0	812
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)	0	0	0	5,953
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)	0	0	0	3,080
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)	0	0	0	6,761
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)	0	0	0	2,216
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)	0	0	0	11,479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)	0	0	0	132
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)	0	0	0	1,790
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)	0	0	0	148
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)	0	0	0	1,420
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)	0	0	0	284
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)	0	0	0	2,977
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)	0	0	0	233
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)	0	0	0	2,279
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)	0	0	0	3,320
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)	0	0	0	21,253

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	463
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)	0	0	0	3,224
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)	0	0	0	217
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)	0	0	0	2,839
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)	0	0	0	548
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)	0	0	0	4,465
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)	0	0	0	1,656
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)	0	0	0	4,520
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)	0	0	0	724
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	107
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)	0	0	0	2,376
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)	0	0	0	107
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	77.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)	0	0	0	394
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)	0	0	0	87.5
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)	0	0	0	2,241
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)	0	0	0	6,113
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)	0	0	0	362
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	101
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)	0	0	0	910
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)	0	0	0	53.5
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	40.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)	0	0	0	197
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)	0	0	0	15.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)	0	0	0	1,356
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)	0	0	0	3,035
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)	0	0	0	543
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)	0	0	0	104

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	1,643
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)	0	0	0	80.5
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	58.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)	0	0	0	295
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)	0	0	0	110
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)	0	0	0	2,731
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)	0	0	0	5,565

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)	0	70.7	46.5	23	18.1	16.6	15.6
Monetary damages from air pollution - Natural Gas (million 2019$)	0	13.8	12.6	14.4	10.6	10	8.5
Monetary damages from air pollution - Transportation (million 2019$)	0	127	133	139	145	152	158
Premature deaths from air pollution - Coal (deaths)	0	7.93	5.22	2.58	2.03	1.87	1.75
Premature deaths from air pollution - Natural Gas (deaths)	0	1.56	1.42	1.63	1.2	1.13	0.961
Premature deaths from air pollution - Transportation (deaths)	0	14.3	15	15.6	16.3	17.1	17.8