Net-Zero America - kentucky state report

2021-03-05

These data underlie graphs and tables presented in the Princeton Net-Zero America study:

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Notes

- These data are all data from the study available at https://netzeroamerica.princeton.edu.
- The Net-Zero America study describes five pathways to reach net-zero emissions and one "no new policies" reference scenario. In this document, state-level results are grouped by scenario. For some scenarios, the study generated national, but not state-level results.
- Within results for a given scenario, data tables are organized into corresponding sections of the full net-zero study (e.g., Pillar 1, Pillar 2, etc.)
- For Pillar 6 (Land sinks), values shown are maximum carbon storage potentials.

Data by category and subcategory

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	12,650	14,338	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of space heating units - Gas Furnace (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3
Sales of water heating units - Gas Furnace (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		3.26	3.36	4.91	5.18	4.05	4.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97
Final energy use - Industry (PJ)	382	396	409	403	409	414	415
Final energy use - Residential (PJ)	184	171	156	137	121	111	106
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.38	3.59	0	0	0	0
Sales of cooking units - Electric Resistance (%)	76.9	81.8	96.9	99.8	100	100	100
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Sales of space heating units - Electric Heat Pump (%)	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Sales of space heating units - Electric Resistance (%)	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of water heating units - Electric Heat Pump (%)	0	8.47	44.9	53	53.3	53.4	53.4
Sales of water heating units - Electric Resistance (%)	62.5	70	49.2	44.5	44.3	44.3	44.3
Sales of water heating units - Gas Furnace (%)	34.2	19.2	3.59	0.151	0	0	0
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	840	2,147	3,490	5,282	5,754	5,483
Public EV charging plugs - DC Fast (1000 units)	0.06	0	1.72	0	7.66	0	12.4
Public EV charging plugs - L2 (1000 units)	0.251	0	41.4	0	184	0	298
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 (%)	1.56	1.82	1.26	0.403	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.9	15.1	46.4	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78.1	48.9	16.6	3.3	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.4	4.53	3.21	1.19	0.29	0.063	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.34	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	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	5.14	0	0	5.51	0
Capital invested - Solar PV - Base (billion $2018)	0	0	0	0	0	0	0.071
Capital invested - Solar PV - Constrained (billion $2018)	0	0.091	0	0	0	0.132	0.08
Capital invested - Wind - Constrained (billion $2018)	0	0	0.098	0.431	0.052	0	0
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Rooftop PV (MW)	45.2	72.8	103	147	208	288	390
Installed (cumulative) - Solar - Base land use assumptions (MW)	68.3	68.3	68.3	68.3	68.3	68.3	145
Installed (cumulative) - Wind - Base land use assumptions (MW)	0	0	0	0	0	0	91.4

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	5,771	5,771	5,771	11,950	11,950
Solar - Base land use assumptions (GWh)	145	0	0	0	0	0	139
Solar - Constrained land use assumptions (GWh)	145	0	0	0	0	0	0
Wind - Constrained land use assumptions (GWh)	0	0	217	838	91	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)	0	0	227	552	552	902	902
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	4,717	5,838	0	6,983	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	6	6	8	8
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	4	4	4	9	9
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	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 9: *E+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	5.71	20.1	22.8	35.3	34.1
Annual - BECCS (MMT)		0	5.71	13.2	13	21.4	21.4
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	6.95	6.44	10.4	9.12
Cumulative - All (MMT)		0	5.71	25.9	48.6	83.9	118
Cumulative - BECCS (MMT)		0	5.71	18.9	31.9	53.4	74.8
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)		0	0	6.95	13.4	23.8	33

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	505	1,390	1,455	2,534	2,836
Cumulative investment - All (million $2018)		0	1,724	2,883	2,920	3,762	4,000
Cumulative investment - Spur (million $2018)		0	284	929	966	1,808	2,046
Cumulative investment - Trunk (million $2018)		0	1,440	1,954	1,954	1,954	1,954
Spur (km)		0	230	1,031	1,097	2,176	2,477
Trunk (km)		0	275	359	359	359	359

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	1.1	1.76	3.61	5.16	6.52
Injection wells (wells)		0	1	4	7	12	15
Resource characterization, appraisal, permitting costs (million $2020)		45.8	128	165	165	165	165
Wells and facilities construction costs (million $2020)		0	30.5	119	212	354	439

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,963
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-136
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,532
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,250
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							247
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,685
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,187
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							124
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,498

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		263	222	178	134	84.2	58.4
Natural gas consumption - Cumulative (tcf)		0	0	0	0	0	5,358
Natural gas production - Annual (tcf)		96.2	91	79.2	67	53.1	41.3
Oil consumption - Annual (million bbls)		88.2	77.2	61.2	46.1	34.1	24.3
Oil consumption - Cumulative (million bbls)		0	0	0	0	0	1,887
Oil production - Annual (million bbls)		2.93	2.94	2.94	2.33	1.89	1.26

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		761	2.43	2.42	2.27	1.72	0.168
Monetary damages from air pollution - Natural Gas (million 2019$)		166	129	71.3	56.6	24.6	8.83
Monetary damages from air pollution - Transportation (million 2019$)		1,223	1,135	858	493	225	90.1
Premature deaths from air pollution - Coal (deaths)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Natural Gas (deaths)		18.7	14.5	8.05	6.39	2.78	0.997
Premature deaths from air pollution - Transportation (deaths)		138	128	96.5	55.5	25.3	10.1

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		96.7	299	1,155	982	1,266	1,043
By economic sector - Construction (jobs)		3,515	4,016	4,488	3,984	3,689	3,953
By economic sector - Manufacturing (jobs)		6,895	8,210	10,972	10,457	8,644	10,810
By economic sector - Mining (jobs)		3,343	2,045	1,485	1,026	741	535
By economic sector - Other (jobs)		192	198	249	252	245	305
By economic sector - Pipeline (jobs)		384	485	428	317	312	353
By economic sector - Professional (jobs)		2,162	1,906	2,831	2,559	2,950	2,893
By economic sector - Trade (jobs)		2,011	1,576	1,563	1,364	1,319	1,276
By economic sector - Utilities (jobs)		5,255	5,483	6,059	5,536	4,636	4,648
By education level - All sectors - Associates degree or some college (jobs)		7,408	7,599	9,006	8,212	7,226	7,950
By education level - All sectors - Bachelors degree (jobs)		4,990	4,941	5,868	5,290	4,789	5,164
By education level - All sectors - Doctoral degree (jobs)		139	128	162	144	149	151
By education level - All sectors - High school diploma or less (jobs)		10,191	10,458	12,880	11,654	10,535	11,394
By education level - All sectors - Masters or professional degree (jobs)		1,128	1,092	1,314	1,177	1,102	1,156

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Biomass (jobs)		295	796	3,253	2,933	4,620	4,463
By resource sector - CO2 (jobs)		24.2	1,338	1,452	1,106	1,664	2,392
By resource sector - Coal (jobs)		3,153	589	505	432	384	339
By resource sector - Grid (jobs)		5,665	6,646	8,440	7,292	6,211	6,045
By resource sector - Natural Gas (jobs)		4,926	4,400	3,428	3,561	2,066	1,464
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		4,580	3,754	2,855	2,011	1,414	933
By resource sector - Solar (jobs)		2,727	3,196	4,630	4,869	4,415	6,347
By resource sector - Wind (jobs)		2,484	3,499	4,667	4,273	3,026	3,833
Median wages - Annual - All ($2019 per job)		54,997	55,154	55,014	55,539	56,203	56,450
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		3,827	3,908	4,608	4,177	3,679	4,012
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		1,415	1,435	1,626	1,462	1,306	1,382
On-Site or In-Plant Training - Total jobs - None (jobs)		3,777	3,876	4,748	4,311	3,904	4,248
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		191	200	236	216	191	209
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		14,645	14,798	18,012	16,312	14,721	15,965
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,882	4,989	5,848	5,304	4,658	5,080
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,345	1,370	1,552	1,397	1,246	1,317
On-the-Job Training - All sectors - None (jobs)		1,241	1,246	1,496	1,352	1,237	1,345
On-the-Job Training - All sectors - Over 10 years (jobs)		233	247	296	271	236	270
On-the-Job Training - All sectors - Up to 1 year (jobs)		16,154	16,366	20,038	18,153	16,423	17,804
Related work experience - All sectors - 1 to 4 years (jobs)		8,676	8,710	10,438	9,429	8,449	9,108
Related work experience - All sectors - 4 to 10 years (jobs)		5,489	5,568	6,575	5,960	5,299	5,768
Related work experience - All sectors - None (jobs)		3,382	3,477	4,217	3,821	3,452	3,720
Related work experience - All sectors - Over 10 years (jobs)		1,540	1,575	1,873	1,704	1,497	1,660
Related work experience - All sectors - Up to 1 year (jobs)		4,768	4,887	6,126	5,562	5,103	5,559
Wage income - All (million $2019)		1,312	1,336	1,608	1,471	1,338	1,457

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	12,642	14,325	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric Heat Pump (%)	5.4	22.1	27.3	42.8	66.9	83.6	89.9
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.24	4.4	4.84	5.52	5.99
Sales of space heating units - Fossil (%)	15.1	5.03	4.61	3.36	1.65	0.539	0.139
Sales of space heating units - Gas Furnace (%)	76.4	68.7	63.8	49.5	26.6	10.3	3.94
Sales of water heating units - Electric Heat Pump (%)	0.117	1.95	7.08	21.8	44.5	59.3	64.4

Table 17: *E- scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	4.29	6.36	8.3	14.3	23.5	29.4	31.5
Sales of water heating units - Gas Furnace (%)	94.4	90.1	83.1	62.2	30.5	9.74	2.54
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.71	2.75	3.26	3.36	4.25	4.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	119	117	114	110	106	103
Final energy use - Industry (PJ)	382	396	410	408	416	420	420
Final energy use - Residential (PJ)	184	172	163	153	142	129	118
Final energy use - Transportation (PJ)	427	394	360	333	312	287	259

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.35	3.47	0	0	0	0
Sales of cooking units - Electric Resistance (%)	76.8	77.4	79.5	85.1	92.9	97.7	99.4
Sales of cooking units - Gas (%)	23.2	22.6	20.5	14.9	7.09	2.29	0.616
Sales of space heating units - Electric Heat Pump (%)	26.6	35.6	39.7	51.4	69.2	80.7	84.7
Sales of space heating units - Electric Resistance (%)	26.5	28.2	26.4	21.5	14.1	9.46	7.83
Sales of space heating units - Fossil (%)	9.65	12.5	11.9	9.77	6.6	4.55	3.88
Sales of space heating units - Gas (%)	37.2	23.6	22	17.4	10.1	5.25	3.56
Sales of water heating units - Electric Heat Pump (%)	0	1.46	5.6	17.5	35.8	47.8	51.9
Sales of water heating units - Electric Resistance (%)	62.5	74	71.8	64.8	54.3	47.5	45.1
Sales of water heating units - Gas Furnace (%)	34.2	22.2	20.3	15.3	7.52	2.39	0.624
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.38	2.39	2.38	2.38

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	0	135	286	962	3,037	4,422
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.518	0	2.83	0	7.94
Public EV charging plugs - L2 (1000 units)	0.251	0	12.5	0	68	0	191
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 (%)	1.57	1.98	2.06	1.64	1.05	0.538	0.231
Vehicle sales - Light-duty - EV (%)	1.88	4.66	11.8	25.8	48.3	72	87.5
Vehicle sales - Light-duty - gasoline (%)	91.8	87.5	79.7	66.7	46.3	24.9	11

Table 21: *E- scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hybrid (%)	4.56	5.37	6.03	5.49	4.12	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.38	0.326	0.249	0.177	0.098	0.046
Vehicle sales - Light-duty - other (%)	0.103	0.107	0.097	0.085	0.061	0.034	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,963
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-136
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,532
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,250
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							247
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,685
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,187
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							124
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,498

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		761	2.43	2.42	2.27	1.72	0.168
Monetary damages from air pollution - Natural Gas (million 2019$)		142	85.7	32.8	14.1	4.84	2.76
Monetary damages from air pollution - Transportation (million 2019$)		1,243	1,249	1,211	1,086	860	589
Premature deaths from air pollution - Coal (deaths)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Natural Gas (deaths)		16.1	9.67	3.71	1.59	0.547	0.312
Premature deaths from air pollution - Transportation (deaths)		140	141	136	122	96.8	66.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	12,650	14,338	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of space heating units - Gas Furnace (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		3.26	3.36	4.91	5.18	4.05	4.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97
Final energy use - Industry (PJ)	382	396	409	403	409	414	415
Final energy use - Residential (PJ)	184	171	156	137	121	111	106
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.38	3.59	0	0	0	0
Sales of cooking units - Electric Resistance (%)	76.9	81.8	96.9	99.8	100	100	100
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Sales of space heating units - Electric Heat Pump (%)	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Sales of space heating units - Electric Resistance (%)	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of water heating units - Electric Heat Pump (%)	0	8.47	44.9	53	53.3	53.4	53.4
Sales of water heating units - Electric Resistance (%)	62.5	70	49.2	44.5	44.3	44.3	44.3
Sales of water heating units - Gas Furnace (%)	34.2	19.2	3.59	0.151	0	0	0
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	840	2,147	3,490	5,282	5,754	5,483
Public EV charging plugs - DC Fast (1000 units)	0.06	0	1.72	0	7.66	0	12.4
Public EV charging plugs - L2 (1000 units)	0.251	0	41.4	0	184	0	298
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 (%)	1.56	1.82	1.26	0.403	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.9	15.1	46.4	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78.1	48.9	16.6	3.3	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.4	4.53	3.21	1.19	0.29	0.063	0

Table 29: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.34	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)	0	0	0	0	0	0.519	5.27
Capital invested - Wind - Base (billion $2018)	0	0	0	0	0.302	0.116	0.175
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Solar - Base land use assumptions (MW)	68.3	68.3	68.3	68.3	68.3	597	6,284
Installed (cumulative) - Wind - Base land use assumptions (MW)	0	0	0	0	256	359	524

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	145		0	0	0	930	10,365
Solar - Constrained land use assumptions (GWh)	145		0	0	0	1,294	10,440
Wind - Base land use assumptions (GWh)	0		0	0	623	237	450
Wind - Constrained land use assumptions (GWh)	0		217	929	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,963
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-136
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,532
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,118

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,250
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							247
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,685
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,187
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							124
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,498

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		761	2.43	2.42	2.27	1.72	0.168
Monetary damages from air pollution - Natural Gas (million 2019$)		138	98.7	54.6	33.5	10.3	3.25
Monetary damages from air pollution - Transportation (million 2019$)		1,223	1,135	858	493	225	90.1
Premature deaths from air pollution - Coal (deaths)		85.9	0.275	0.273	0.256	0.195	0.019

Table 34: *E+RE+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Natural Gas (deaths)		15.6	11.1	6.16	3.78	1.16	0.366
Premature deaths from air pollution - Transportation (deaths)		138	128	96.5	55.5	25.3	10.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	12,650	14,338	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Sales of space heating units - Electric Heat Pump (%)	5.4	31	77.5	91	92.2	92.3	92.3
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.51	5.9	6.19	6.19	6.21
Sales of space heating units - Fossil (%)	15.1	4.35	0.819	0.034	0	0	0
Sales of space heating units - Gas Furnace (%)	76.4	60.5	17.1	3.03	1.58	1.53	1.52
Sales of water heating units - Electric Heat Pump (%)	0.117	10.6	55.7	65.7	66.2	66.2	66.2
Sales of water heating units - Electric Resistance (%)	4.29	9.87	28	32.1	32.3	32.2	32.3
Sales of water heating units - Gas Furnace (%)	94.4	77.9	14.7	0.621	0	0	0
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		3.26	3.36	4.91	5.18	4.05	4.16

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	118	113	105	99.3	96.6	97
Final energy use - Industry (PJ)	382	396	409	403	409	414	415
Final energy use - Residential (PJ)	184	171	156	137	121	111	106
Final energy use - Transportation (PJ)	426	391	344	288	236	205	193

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.38	3.59	0	0	0	0
Sales of cooking units - Electric Resistance (%)	76.9	81.8	96.9	99.8	100	100	100
Sales of cooking units - Gas (%)	23.1	18.2	3.11	0.157	0	0	0
Sales of space heating units - Electric Heat Pump (%)	26.6	42.5	77.8	85.8	86.2	86.1	86.1
Sales of space heating units - Electric Resistance (%)	26.5	25.4	10.6	7.34	7.19	7.29	7.32
Sales of space heating units - Fossil (%)	9.65	11.3	5.2	3.78	3.67	3.61	3.61
Sales of space heating units - Gas (%)	37.2	20.8	6.32	3.1	2.98	2.95	2.94
Sales of water heating units - Electric Heat Pump (%)	0	8.47	44.9	53	53.3	53.4	53.4
Sales of water heating units - Electric Resistance (%)	62.5	70	49.2	44.5	44.3	44.3	44.3

Table 38: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	34.2	19.2	3.59	0.151	0	0	0
Sales of water heating units - Other (%)	3.3	2.39	2.36	2.36	2.36	2.37	2.38

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	840	2,147	3,490	5,282	5,754	5,483
Public EV charging plugs - DC Fast (1000 units)	0.06	0	1.72	0	7.66	0	12.4
Public EV charging plugs - L2 (1000 units)	0.251	0	41.4	0	184	0	298
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 (%)	1.56	1.82	1.26	0.403	0.075	0.013	0
Vehicle sales - Light-duty - EV (%)	3.9	15.1	46.4	81.8	96.3	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.9	78.1	48.9	16.6	3.3	0.59	0
Vehicle sales - Light-duty - hybrid (%)	4.4	4.53	3.21	1.19	0.29	0.063	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.34	0.203	0.063	0.013	0.002	0
Vehicle sales - Light-duty - other (%)	0.102	0.098	0.064	0.022	0.004	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0	0	0	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)	145						
Solar - Constrained land use assumptions (GWh)	145						

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,963

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-136
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,532
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-432
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,618
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-67.9
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,250
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							247
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,685
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							188
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,187
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							124
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,498

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							91.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		761	2.43	2.42	2.27	1.72	0.168
Monetary damages from air pollution - Natural Gas (million 2019$)		140	91.6	117	86.9	29.1	8.96
Monetary damages from air pollution - Transportation (million 2019$)		1,223	1,135	858	493	225	90.1
Premature deaths from air pollution - Coal (deaths)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Natural Gas (deaths)		15.7	10.3	13.2	9.81	3.29	1.01
Premature deaths from air pollution - Transportation (deaths)		138	128	96.5	55.5	25.3	10.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	12,642	14,325	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Sales of space heating units - Electric Heat Pump (%)	5.4	22.1	27.3	42.8	66.9	83.6	89.9
Sales of space heating units - Electric Resistance (%)	3.11	4.17	4.24	4.4	4.84	5.52	5.99
Sales of space heating units - Fossil (%)	15.1	5.03	4.61	3.36	1.65	0.539	0.139
Sales of space heating units - Gas Furnace (%)	76.4	68.7	63.8	49.5	26.6	10.3	3.94
Sales of water heating units - Electric Heat Pump (%)	0.117	1.95	7.08	21.8	44.5	59.3	64.4
Sales of water heating units - Electric Resistance (%)	4.29	6.36	8.3	14.3	23.5	29.4	31.5
Sales of water heating units - Gas Furnace (%)	94.4	90.1	83.1	62.2	30.5	9.74	2.54
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		2.71	2.75	3.26	3.36	4.25	4.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	119	117	114	110	106	103
Final energy use - Industry (PJ)	382	396	410	408	416	420	420
Final energy use - Residential (PJ)	184	172	163	153	142	129	118
Final energy use - Transportation (PJ)	427	394	360	333	312	287	259

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.35	3.47	0	0	0	0
Sales of cooking units - Electric Resistance (%)	76.8	77.4	79.5	85.1	92.9	97.7	99.4
Sales of cooking units - Gas (%)	23.2	22.6	20.5	14.9	7.09	2.29	0.616
Sales of space heating units - Electric Heat Pump (%)	26.6	35.6	39.7	51.4	69.2	80.7	84.7
Sales of space heating units - Electric Resistance (%)	26.5	28.2	26.4	21.5	14.1	9.46	7.83
Sales of space heating units - Fossil (%)	9.65	12.5	11.9	9.77	6.6	4.55	3.88
Sales of space heating units - Gas (%)	37.2	23.6	22	17.4	10.1	5.25	3.56
Sales of water heating units - Electric Heat Pump (%)	0	1.46	5.6	17.5	35.8	47.8	51.9
Sales of water heating units - Electric Resistance (%)	62.5	74	71.8	64.8	54.3	47.5	45.1
Sales of water heating units - Gas Furnace (%)	34.2	22.2	20.3	15.3	7.52	2.39	0.624
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.38	2.39	2.38	2.38

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs - Cumulative 5-yr (million $2018)	0	0	135	286	962	3,037	4,422
Public EV charging plugs - DC Fast (1000 units)	0.06	0	0.518	0	2.83	0	7.94
Public EV charging plugs - L2 (1000 units)	0.251	0	12.5	0	68	0	191
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 (%)	1.57	1.98	2.06	1.64	1.05	0.538	0.231
Vehicle sales - Light-duty - EV (%)	1.88	4.66	11.8	25.8	48.3	72	87.5
Vehicle sales - Light-duty - gasoline (%)	91.8	87.5	79.7	66.7	46.3	24.9	11
Vehicle sales - Light-duty - hybrid (%)	4.56	5.37	6.03	5.49	4.12	2.44	1.18
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.38	0.326	0.249	0.177	0.098	0.046
Vehicle sales - Light-duty - other (%)	0.103	0.107	0.097	0.085	0.061	0.034	0.015
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0.018	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	31.9	0	7.92	5.72	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	18	18
Biomass w/ccu power plant (GWh)	0	0	35,757	35,757	44,647	51,069	51,069

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	2,298	2,298	2,870	3,689	3,789
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	29,223	0	7,265	9,733	1,101
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	5	6
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	29	29	36	40	40
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	35.4	35.4	47.5	59.7	61.2
Annual - BECCS (MMT)		0	35.4	35.4	44.2	56.3	57.5
Annual - Cement and lime (MMT)		0	0	0	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0	0	0	0.14
Cumulative - All (MMT)		0	35.4	70.8	118	178	239
Cumulative - BECCS (MMT)		0	35.4	70.8	115	171	229
Cumulative - Cement and lime (MMT)		0	0	0	3.32	6.74	10.3
Cumulative - NGCC (MMT)		0	0	0	0	0	0.14

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	1,500	1,584	1,637	2,764	3,373
Cumulative investment - All (million $2018)		0	3,203	3,800	4,513	5,600	6,265
Cumulative investment - Spur (million $2018)		0	1,678	1,677	1,686	2,774	3,438
Cumulative investment - Trunk (million $2018)		0	1,525	2,123	2,827	2,827	2,827
Spur (km)		0	1,225	1,225	1,195	2,322	2,931
Trunk (km)		0	275	359	442	442	442

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	1.85	6.42	13.1	17.7	18.4
Injection wells (wells)		0	3	12	21	35	44
Resource characterization, appraisal, permitting costs (million $2020)		45.8	201	311	311	311	311
Wells and facilities construction costs (million $2020)		0	91.4	356	635	1,062	1,318

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-971
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,584
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-124
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-5,680
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-971
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,418
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-62.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-3,451
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							395
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							5,086
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							92.2
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							432
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							226
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,231
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							395
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,086
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							92.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							432
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							113
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,118

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		761	2.43	2.42	2.27	1.72	0.168
Monetary damages from air pollution - Natural Gas (million 2019$)		144	82.8	45.5	28.5	14.3	5.55
Monetary damages from air pollution - Transportation (million 2019$)		1,243	1,249	1,211	1,086	860	589
Premature deaths from air pollution - Coal (deaths)		85.9	0.275	0.273	0.256	0.195	0.019
Premature deaths from air pollution - Natural Gas (deaths)		16.3	9.35	5.14	3.22	1.62	0.626
Premature deaths from air pollution - Transportation (deaths)		140	141	136	122	96.8	66.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)	0	12,419	12,935	0	0	0	0
Sales of cooking units - Electric Resistance (%)	43.5	45.6	45.9	45.7	46	45.9	45.7
Sales of cooking units - Gas (%)	56.5	54.4	54.1	54.3	54	54.1	54.3

Table 59: *REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	5.4	26.5	53.4	75.5	79.2	79.6	79.6
Sales of space heating units - Electric Resistance (%)	3.11	5.03	9.13	15	18.3	18.8	18.9
Sales of space heating units - Fossil (%)	15.1	4.63	2.27	0.341	0.034	0	0
Sales of space heating units - Gas Furnace (%)	76.4	63.9	35.2	9.15	2.46	1.58	1.52
Sales of water heating units - Electric Heat Pump (%)	0.117	0.149	0.144	0.146	0.145	0.143	0.145
Sales of water heating units - Electric Resistance (%)	4.29	5.63	5.49	5.57	5.54	5.49	5.54
Sales of water heating units - Gas Furnace (%)	94.4	92.6	92.8	92.7	92.7	92.8	92.8
Sales of water heating units - Other (%)	1.17	1.57	1.57	1.57	1.57	1.56	1.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		3.28	3.39	4.37	4.58	4.26	4.41

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	119	120	121	120	120	122	127
Final energy use - Industry (PJ)	382	406	427	438	455	470	488
Final energy use - Residential (PJ)	184	172	165	159	157	156	157
Final energy use - Transportation (PJ)	426	395	363	345	346	357	372

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)	0	3.33	3.22	0	0	0	0
Sales of cooking units - Electric Resistance (%)	76.6	76.6	76.6	76.6	76.6	76.6	76.6
Sales of cooking units - Gas (%)	23.4	23.4	23.4	23.4	23.4	23.4	23.4
Sales of space heating units - Electric Heat Pump (%)	24.6	48.5	49.4	50.7	51.9	53.4	55.7
Sales of space heating units - Electric Resistance (%)	27.3	23.3	22.9	22.2	21.3	19.9	17.6
Sales of space heating units - Fossil (%)	9.89	9.17	7.81	7.09	6.94	6.85	6.89
Sales of space heating units - Gas (%)	38.3	19	19.9	20	19.9	19.9	19.8
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	62.5	74.8	75	74.8	74.6	74.6	74.6
Sales of water heating units - Gas Furnace (%)	34.2	22.8	22.6	22.8	23	23	23
Sales of water heating units - Other (%)	3.3	2.39	2.37	2.39	2.4	2.4	2.41

Table 63: *REF scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - diesel (%)	98.1	98.2	97.9	97	95.6	93.5	91.6
Vehicle sales - Heavy-duty - EV (%)	0	0	0	0	0	0	0
Vehicle sales - Heavy-duty - gasoline (%)	0.229	0.242	0.257	0.274	0.294	0.317	0.343
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.096	0.112	0.13	0.15	0.174	0.202
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.119	0.138	0.16	0.186	0.216	0.25	0.29

Table 63: *REF scenario - PILLAR 1: Efficiency/Electrification - Transportation (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.56	1.97	2.19	2.03	1.83	1.71	1.62
Vehicle sales - Light-duty - EV (%)	3.54	5.57	6.35	7.81	9.51	11	12.2
Vehicle sales - Light-duty - gasoline (%)	90.3	86.7	84.6	82.7	80.7	78.7	77.2
Vehicle sales - Light-duty - hybrid (%)	4.42	5.26	6.45	7.01	7.58	8.17	8.62
Vehicle sales - Light-duty - hydrogen FC (%)	0.111	0.377	0.346	0.308	0.305	0.305	0.316
Vehicle sales - Light-duty - other (%)	0.102	0.106	0.103	0.103	0.103	0.101	0.104
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 64: *REF scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-96.7
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-27,796
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,537
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,669
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-48.1
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-4,665
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-965
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,409
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-10,207
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,200
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-48.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,956
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,177
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-24.5
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,555
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-338
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-704
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-773
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,079
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-72.6

Table 64: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-17,376
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-897
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,923
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-35.9
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,110
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-651
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,057
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,490
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.8
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,891
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							17.7
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							91.7
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							93.2
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							290
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,061
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							4,668
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.91
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,107
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							8.86
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

Table 64: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							48.3
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							46.6
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							50.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							642
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,107
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.9
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							202
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,999
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							13.3
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							70
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							69.9
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							363
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,293
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,022

Table 65: *REF scenario - PILLAR 6: Land sinks - Forests - REF only*

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-13.6		-9.57				-7.76
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.27		-2.12				-2.23
Business-as-usual carbon sink - Total (Mt CO2e/y)	-14.9		-11.7				-9.99

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,969	1,409	1,188	1,068	1,025	1,005
Monetary damages from air pollution - Natural Gas (million 2019$)		134	177	193	250	199	173
Monetary damages from air pollution - Transportation (million 2019$)		1,243	1,267	1,291	1,321	1,351	1,382

Table 66: *REF scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Coal (deaths)		222	159	134	121	116	113
Premature deaths from air pollution - Natural Gas (deaths)		15.2	19.9	21.8	28.2	22.5	19.5
Premature deaths from air pollution - Transportation (deaths)		140	142	145	149	152	155