Net-Zero America - colorado 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	14,374	15,990	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 (%)	2.64	8.18	30.6	79.8	90	90.8	90.8
Sales of space heating units - Electric Resistance (%)	2.48	3.49	4.92	8.08	8.66	8.7	8.7
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0
Sales of space heating units - Gas Furnace (%)	94.9	88.1	64.4	12.2	1.37	0.522	0.498
Sales of water heating units - Electric Heat Pump (%)	0.022	1.12	14.3	42.9	48.9	49.4	49.4
Sales of water heating units - Electric Resistance (%)	1.1	2.5	15.4	43.8	49.7	50.2	50.2
Sales of water heating units - Gas Furnace (%)	98.6	96	69.9	12.9	0.972	0.027	0
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383

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)		2.81	2.93	5.73	6.16	6.1	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	162	162	159	152	144	138	135
Final energy use - Industry (PJ)	171	180	187	200	221	233	246
Final energy use - Residential (PJ)	237	229	221	199	170	148	133
Final energy use - Transportation (PJ)	472	443	394	334	279	243	226

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	4.42	4.7	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.5	61	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.5	39	6.67	0.336	0	0	0
Sales of space heating units - Electric Heat Pump (%)	5.62	14.5	37.2	82.6	92	92.7	92.7
Sales of space heating units - Electric Resistance (%)	7.65	13.8	11	4.91	3.67	3.58	3.63
Sales of space heating units - Fossil (%)	3.24	5.67	4.53	2.12	1.56	1.5	1.52
Sales of space heating units - Gas (%)	83.5	66	47.3	10.4	2.8	2.21	2.19
Sales of water heating units - Electric Heat Pump (%)	0	0.93	12.1	36.4	41.4	41.7	41.8
Sales of water heating units - Electric Resistance (%)	13.2	25.9	34.2	52.7	56.7	57	57
Sales of water heating units - Gas Furnace (%)	85.7	72	52.4	9.64	0.728	0.02	0
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.21	1.21	1.21

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	1,014	2,644	4,211	6,408	6,943	6,637
Public EV charging plugs - DC Fast (1000 units)	0.303	0	1.77	0	7.25	0	11.6
Public EV charging plugs - L2 (1000 units)	2.12	0	42.5	0	174	0	280
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.78	2.01	1.35	0.434	0.078	0.013	0
Vehicle sales - Light-duty - EV (%)	3.16	12.9	42.9	80.4	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.2	80.6	52.5	18	3.48	0.596	0
Vehicle sales - Light-duty - hybrid (%)	3.68	4.01	2.95	1.12	0.269	0.057	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.353	0.221	0.07	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.112	0.108	0.073	0.026	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 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	0.01	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0.041	0.399
Capital invested - Solar PV - Base (billion $2018)	0	0.669	0.644	2.54	2.97	3.43	2.48
Capital invested - Solar PV - Constrained (billion $2018)	0	1.95	1.04	2.19	2.61	2.02	0.721
Capital invested - Wind - Base (billion $2018)	0	0.226	1.91	0.621	2.45	2.98	1.38
Capital invested - Wind - Constrained (billion $2018)	0	1.32	2.22	2.91	6.72	6.61	3.73
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Rooftop PV (MW)	895	1,362	1,825	2,410	3,134	4,018	5,120
Installed (cumulative) - Solar - Base land use assumptions (MW)	454	954	1,492	3,798	6,651	10,148	12,829
Installed (cumulative) - Wind - Base land use assumptions (MW)	4,732	4,886	6,317	6,818	8,895	11,556	12,854

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	9.89	9.89
Biomass w/ccu power plant (GWh)	0	0	0	0	0	46.2	494
Solar - Base land use assumptions (GWh)	1,142	1,091	1,209	5,124	6,381	7,849	6,054
Solar - Constrained land use assumptions (GWh)	856	0	2,293	6,152	8,882	3,132	5,821

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

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Base land use assumptions (GWh)	16,760	572	5,100	1,679	7,152	8,907	4,322
Wind - Constrained land use assumptions (GWh)	16,760	587	2,499	4,372	15,416	15,442	9,986

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	23.6	190	345
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	330	2,342	2,221
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	1	3	5
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	0	0	0	2	3
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	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.02	3.38	3.77	6.87	9.81
Annual - BECCS (MMT)		0	0	0	0.42	3.41	6.22
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0.02	0.02	0.03	0.03	0.05
Cumulative - All (MMT)		0	0.02	3.4	7.17	14	23.9
Cumulative - BECCS (MMT)		0	0	0	0.42	3.83	10.1
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6
Cumulative - NGCC (MMT)		0	0.02	0.04	0.07	0.1	0.15

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	256	556	861	1,099	2,219
Cumulative investment - All (million $2018)		0	1,225	1,484	1,687	1,902	2,649
Cumulative investment - Spur (million $2018)		0	0.3	259	463	677	1,424
Cumulative investment - Trunk (million $2018)		0	1,225	1,225	1,225	1,225	1,225
Spur (km)		0	0.5	301	605	843	1,963
Trunk (km)		0	255	255	255	255	255

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	0.88	0.9	1.72	2.8
Injection wells (wells)		0	0	2	3	5	6
Resource characterization, appraisal, permitting costs (million $2020)		36	86.3	101	101	101	101
Wells and facilities construction costs (million $2020)		0	12	46.7	83.2	139	173

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)							-173
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,661
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,048
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-173
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,384
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-107
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,664
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,977
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							329
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,478
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,071
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							164
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,407

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)							-1,620
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-812
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-34,021
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,092
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89

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 retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
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)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
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)							92.3

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 cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		377	318	255	192	121	83.7
Natural gas consumption - Cumulative (tcf)		0	0	0	0	0	7,678
Natural gas production - Annual (tcf)		2,061	1,948	1,697	1,435	1,138	884
Oil consumption - Annual (million bbls)		87.6	75.4	57.8	41.6	28.7	18.8
Oil consumption - Cumulative (million bbls)		0	0	0	0	0	1,793
Oil production - Annual (million bbls)		230	231	231	183	149	98.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		220	0.263	0.262	0.198	0.123	0.001
Monetary damages from air pollution - Natural Gas (million 2019$)		278	225	189	184	111	26.5
Monetary damages from air pollution - Transportation (million 2019$)		914	899	717	433	203	77.7
Premature deaths from air pollution - Coal (deaths)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Natural Gas (deaths)		31.4	25.4	21.3	20.8	12.6	2.99
Premature deaths from air pollution - Transportation (deaths)		103	101	80.7	48.7	22.8	8.74

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		227	238	217	150	226	312
By economic sector - Construction (jobs)		11,496	11,816	13,596	15,058	16,387	17,444
By economic sector - Manufacturing (jobs)		12,947	16,996	19,901	17,693	15,315	15,730
By economic sector - Mining (jobs)		14,440	11,148	8,609	5,627	3,632	2,001
By economic sector - Other (jobs)		908	996	1,497	1,953	2,417	3,325
By economic sector - Pipeline (jobs)		1,289	1,273	1,048	827	631	478
By economic sector - Professional (jobs)		6,910	6,768	7,408	8,021	8,895	9,641
By economic sector - Trade (jobs)		7,383	6,697	6,720	6,405	6,459	6,735
By economic sector - Utilities (jobs)		7,757	8,117	9,529	11,820	13,543	13,159
By education level - All sectors - Associates degree or some college (jobs)		18,679	19,184	20,847	21,005	21,249	21,888
By education level - All sectors - Bachelors degree (jobs)		14,729	14,484	14,975	14,290	13,975	13,963
By education level - All sectors - Doctoral degree (jobs)		491	464	471	461	469	482
By education level - All sectors - High school diploma or less (jobs)		25,997	26,575	28,796	28,463	28,478	29,132

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Masters or professional degree (jobs)		3,461	3,342	3,437	3,335	3,333	3,359
By resource sector - Biomass (jobs)		553	552	488	376	833	1,367
By resource sector - CO2 (jobs)		18.7	861	190	326	524	982
By resource sector - Coal (jobs)		1,735	395	82.3	68.3	59.3	51.9
By resource sector - Grid (jobs)		8,248	9,262	14,112	18,554	22,996	22,700
By resource sector - Natural Gas (jobs)		14,315	12,133	9,627	8,311	5,968	4,045
By resource sector - Nuclear (jobs)		0	0.003	0.007	0.008	0.018	0.03
By resource sector - Oil (jobs)		25,199	22,582	20,059	14,539	10,815	6,718
By resource sector - Solar (jobs)		7,221	8,199	13,796	15,639	17,400	23,905
By resource sector - Wind (jobs)		6,068	10,065	10,172	9,741	8,906	9,055
Median wages - Annual - All ($2019 per job)		67,769	67,624	67,470	67,966	68,698	68,703
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		9,981	10,136	10,912	10,911	10,988	11,200
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		3,880	3,854	4,119	4,254	4,400	4,481
On-Site or In-Plant Training - Total jobs - None (jobs)		10,232	10,367	11,085	10,907	10,893	11,212
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		473	492	542	560	576	592
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		38,792	39,199	41,868	40,922	40,646	41,339
On-the-Job Training - All sectors - 1 to 4 years (jobs)		12,708	12,898	13,881	13,945	14,086	14,368
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,575	3,568	3,862	4,069	4,269	4,394
On-the-Job Training - All sectors - None (jobs)		3,559	3,531	3,730	3,632	3,615	3,720
On-the-Job Training - All sectors - Over 10 years (jobs)		630	657	709	686	668	688
On-the-Job Training - All sectors - Up to 1 year (jobs)		42,884	43,394	46,344	45,221	44,865	45,654
Related work experience - All sectors - 1 to 4 years (jobs)		23,367	23,442	24,915	24,462	24,385	24,708
Related work experience - All sectors - 4 to 10 years (jobs)		14,810	14,920	15,877	15,693	15,688	15,915
Related work experience - All sectors - None (jobs)		8,844	8,982	9,663	9,621	9,689	9,925
Related work experience - All sectors - Over 10 years (jobs)		4,142	4,210	4,477	4,344	4,267	4,305
Related work experience - All sectors - Up to 1 year (jobs)		12,194	12,494	13,595	13,434	13,474	13,971
Wage income - All (million $2019)		4,294	4,331	4,624	4,592	4,638	4,729

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	14,373	15,986	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 (%)	2.64	7.26	9.83	18.3	38.7	64.6	80
Sales of space heating units - Electric Resistance (%)	2.48	3.43	3.58	4.11	5.42	7.07	8.03
Sales of space heating units - Fossil (%)	0	0.241	0.225	0.171	0.089	0.035	0.016
Sales of space heating units - Gas Furnace (%)	94.9	89.1	86.4	77.4	55.8	28.3	12

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0.022	0.571	2.07	7.05	19	34.1	43.1
Sales of water heating units - Electric Resistance (%)	1.1	2	3.47	8.35	20.1	35.1	44
Sales of water heating units - Gas Furnace (%)	98.6	97	94.1	84.2	60.5	30.4	12.5
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383

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)		2.32	2.38	3.28	3.43	5.13	5.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	162	162	161	160	158	155	151
Final energy use - Industry (PJ)	171	181	188	203	226	238	250
Final energy use - Residential (PJ)	237	229	225	220	212	196	175
Final energy use - Transportation (PJ)	472	446	410	379	355	326	292

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	4.41	4.7	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.3	51.6	56.1	68.1	84.8	95.1	98.7
Sales of cooking units - Gas (%)	49.7	48.4	43.9	31.9	15.2	4.9	1.32
Sales of space heating units - Electric Heat Pump (%)	5.62	13.3	15.8	24.3	44	68.4	82.7
Sales of space heating units - Electric Resistance (%)	7.65	13.9	13.5	12.5	10.1	6.84	4.95
Sales of space heating units - Fossil (%)	3.24	5.74	5.68	5.1	3.9	2.66	2.01
Sales of space heating units - Gas (%)	83.5	67.1	65	58.1	42	22.1	10.3
Sales of water heating units - Electric Heat Pump (%)	0	0.46	1.74	5.96	16.1	28.9	36.5
Sales of water heating units - Electric Resistance (%)	13.2	25.6	26.5	29.7	37.4	47.1	52.9
Sales of water heating units - Gas Furnace (%)	85.7	72.7	70.5	63.1	45.3	22.7	9.32
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.22	1.22	1.21

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	172	344	1,178	3,652	5,339
Public EV charging plugs - DC Fast (1000 units)	0.303	0	0.614	0	2.74	0	7.45
Public EV charging plugs - L2 (1000 units)	2.12	0	14.8	0	65.9	0	179
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 (%)	1.79	2.16	2.1	1.68	1.1	0.567	0.242

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - EV (%)	1.62	4.1	10.6	23.9	46.2	70.6	87
Vehicle sales - Light-duty - gasoline (%)	92.6	88.6	81.5	69.1	48.7	26.4	11.6
Vehicle sales - Light-duty - hybrid (%)	3.8	4.66	5.29	4.92	3.8	2.31	1.14
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.387	0.339	0.264	0.191	0.107	0.05
Vehicle sales - Light-duty - other (%)	0.113	0.116	0.107	0.094	0.069	0.038	0.017
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)							-173
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,661
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,048
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-173
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,384
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-107
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,664
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,977
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							329
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,478
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,071
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							164

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,407

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)							-1,620
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-812
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-34,021
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,092
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
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)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
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)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
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)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		220	0.263	0.262	0.198	0.123	0.001
Monetary damages from air pollution - Natural Gas (million 2019$)		275	198	169	121	58.3	16.9
Monetary damages from air pollution - Transportation (million 2019$)		929	987	1,006	945	783	556
Premature deaths from air pollution - Coal (deaths)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Natural Gas (deaths)		31.1	22.4	19.1	13.7	6.58	1.91
Premature deaths from air pollution - Transportation (deaths)		104	111	113	106	88	62.5

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	14,374	15,990	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 (%)	2.64	8.18	30.6	79.8	90	90.8	90.8
Sales of space heating units - Electric Resistance (%)	2.48	3.49	4.92	8.08	8.66	8.7	8.7
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	94.9	88.1	64.4	12.2	1.37	0.522	0.498
Sales of water heating units - Electric Heat Pump (%)	0.022	1.12	14.3	42.9	48.9	49.4	49.4
Sales of water heating units - Electric Resistance (%)	1.1	2.5	15.4	43.8	49.7	50.2	50.2
Sales of water heating units - Gas Furnace (%)	98.6	96	69.9	12.9	0.972	0.027	0
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383

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)		2.81	2.93	5.73	6.16	6.1	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	162	162	159	152	144	138	135
Final energy use - Industry (PJ)	171	180	187	200	221	233	246
Final energy use - Residential (PJ)	237	229	221	199	170	148	133
Final energy use - Transportation (PJ)	472	443	394	334	279	243	226

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	4.42	4.7	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.5	61	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.5	39	6.67	0.336	0	0	0
Sales of space heating units - Electric Heat Pump (%)	5.62	14.5	37.2	82.6	92	92.7	92.7
Sales of space heating units - Electric Resistance (%)	7.65	13.8	11	4.91	3.67	3.58	3.63
Sales of space heating units - Fossil (%)	3.24	5.67	4.53	2.12	1.56	1.5	1.52
Sales of space heating units - Gas (%)	83.5	66	47.3	10.4	2.8	2.21	2.19
Sales of water heating units - Electric Heat Pump (%)	0	0.93	12.1	36.4	41.4	41.7	41.8
Sales of water heating units - Electric Resistance (%)	13.2	25.9	34.2	52.7	56.7	57	57
Sales of water heating units - Gas Furnace (%)	85.7	72	52.4	9.64	0.728	0.02	0
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.21	1.21	1.21

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	1,014	2,644	4,211	6,408	6,943	6,637
Public EV charging plugs - DC Fast (1000 units)	0.303	0	1.77	0	7.25	0	11.6
Public EV charging plugs - L2 (1000 units)	2.12	0	42.5	0	174	0	280
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.78	2.01	1.35	0.434	0.078	0.013	0
Vehicle sales - Light-duty - EV (%)	3.16	12.9	42.9	80.4	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.2	80.6	52.5	18	3.48	0.596	0
Vehicle sales - Light-duty - hybrid (%)	3.68	4.01	2.95	1.12	0.269	0.057	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.353	0.221	0.07	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.112	0.108	0.073	0.026	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 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	2.45	2.57	4.26	7.7	35.7
Capital invested - Wind - Base (billion $2018)	0	0.715	1.61	2.18	6.64	8.39	38.4
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Solar - Base land use assumptions (MW)	454	454	2,501	4,835	8,938	16,787	55,294
Installed (cumulative) - Wind - Base land use assumptions (MW)	4,732	5,218	6,428	8,188	13,808	21,290	57,595

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,142	0	4,510	5,224	9,077	17,551	85,919
Solar - Constrained land use assumptions (GWh)	1,142	1,743	6,552	2,471	7,600	13,494	90,049
Wind - Base land use assumptions (GWh)	16,760	1,766	4,273	6,042	18,802	24,359	111,347
Wind - Constrained land use assumptions (GWh)	16,760	706	2,976	14,054	35,526	48,314	152,249

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)							-173
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,661
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,048
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-173
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,384

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-107
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,664
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,977
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							329
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,478
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,071
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							164
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,407

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)							-1,620
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-812
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-34,021
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,092
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
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)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083

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 - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
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)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
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)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		220	0.263	0.262	0.198	0.123	0.001

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Natural Gas (million 2019$)		251	170	108	96.9	46.8	13.5
Monetary damages from air pollution - Transportation (million 2019$)		914	899	717	433	203	77.7
Premature deaths from air pollution - Coal (deaths)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Natural Gas (deaths)		28.4	19.2	12.2	10.9	5.28	1.53
Premature deaths from air pollution - Transportation (deaths)		103	101	80.7	48.7	22.8	8.74

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	14,374	15,990	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 (%)	2.64	8.18	30.6	79.8	90	90.8	90.8
Sales of space heating units - Electric Resistance (%)	2.48	3.49	4.92	8.08	8.66	8.7	8.7
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0
Sales of space heating units - Gas Furnace (%)	94.9	88.1	64.4	12.2	1.37	0.522	0.498
Sales of water heating units - Electric Heat Pump (%)	0.022	1.12	14.3	42.9	48.9	49.4	49.4
Sales of water heating units - Electric Resistance (%)	1.1	2.5	15.4	43.8	49.7	50.2	50.2
Sales of water heating units - Gas Furnace (%)	98.6	96	69.9	12.9	0.972	0.027	0
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383

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)		2.81	2.93	5.73	6.16	6.1	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	162	162	159	152	144	138	135
Final energy use - Industry (PJ)	171	180	187	200	221	233	246
Final energy use - Residential (PJ)	237	229	221	199	170	148	133
Final energy use - Transportation (PJ)	472	443	394	334	279	243	226

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	4.42	4.7	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.5	61	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.5	39	6.67	0.336	0	0	0
Sales of space heating units - Electric Heat Pump (%)	5.62	14.5	37.2	82.6	92	92.7	92.7
Sales of space heating units - Electric Resistance (%)	7.65	13.8	11	4.91	3.67	3.58	3.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Fossil (%)	3.24	5.67	4.53	2.12	1.56	1.5	1.52
Sales of space heating units - Gas (%)	83.5	66	47.3	10.4	2.8	2.21	2.19
Sales of water heating units - Electric Heat Pump (%)	0	0.93	12.1	36.4	41.4	41.7	41.8
Sales of water heating units - Electric Resistance (%)	13.2	25.9	34.2	52.7	56.7	57	57
Sales of water heating units - Gas Furnace (%)	85.7	72	52.4	9.64	0.728	0.02	0
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.21	1.21	1.21

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	1,014	2,644	4,211	6,408	6,943	6,637
Public EV charging plugs - DC Fast (1000 units)	0.303	0	1.77	0	7.25	0	11.6
Public EV charging plugs - L2 (1000 units)	2.12	0	42.5	0	174	0	280
Vehicle sales - Heavy-duty - diesel (%)	97.2	92.1	67	23.3	4.22	0.628	0
Vehicle sales - Heavy-duty - EV (%)	0.588	3.81	19	45.6	57.4	59.6	60
Vehicle sales - Heavy-duty - gasoline (%)	0.227	0.227	0.176	0.066	0.013	0.002	0
Vehicle sales - Heavy-duty - hybrid (%)	0.082	0.09	0.077	0.031	0.007	0.001	0
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.392	2.54	12.7	30.4	38.2	39.7	40
Vehicle sales - Heavy-duty - other (%)	1.5	1.23	1.07	0.568	0.163	0.038	0
Vehicle sales - Light-duty - diesel (%)	1.78	2.01	1.35	0.434	0.078	0.013	0
Vehicle sales - Light-duty - EV (%)	3.16	12.9	42.9	80.4	96.2	99.3	100
Vehicle sales - Light-duty - gasoline (%)	91.2	80.6	52.5	18	3.48	0.596	0
Vehicle sales - Light-duty - hybrid (%)	3.68	4.01	2.95	1.12	0.269	0.057	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.353	0.221	0.07	0.014	0.002	0
Vehicle sales - Light-duty - other (%)	0.112	0.108	0.073	0.026	0.005	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

Table 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)		1.75	1.27	0.371	2.34	0.528	2.49
Capital invested - Solar PV - Constrained (billion $2018)		1.93	1.68	1.09	2.24	1.88	2.36
Capital invested - Wind - Base (billion $2018)		0.169	1.35	0.606	1.04	1.29	0.427
Capital invested - Wind - Constrained (billion $2018)		0.254	0.437	0.539	2.97	2.95	1.03

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,250	2,884	2,354	751	5,088	1,229	5,951
Solar - Constrained land use assumptions (GWh)	1,939	3,134	3,132	2,194	4,791	4,294	5,636
Wind - Base land use assumptions (GWh)	16,760	431	3,659	1,686	3,029	3,949	1,378
Wind - Constrained land use assumptions (GWh)	16,760	587	1,092	1,407	7,802	8,170	2,956

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)							-173
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,661
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,048
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-173
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,384
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-107
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,664
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,977
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							329
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,478
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,071
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							164
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,407

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)							-1,620
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-812
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-34,021
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,092
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
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)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
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)							92.3

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 - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		220	0.263	0.262	0.198	0.123	0.001
Monetary damages from air pollution - Natural Gas (million 2019$)		267	186	193	368	169	19.3
Monetary damages from air pollution - Transportation (million 2019$)		914	899	717	433	203	77.7
Premature deaths from air pollution - Coal (deaths)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Natural Gas (deaths)		30.1	21	21.8	41.5	19	2.18
Premature deaths from air pollution - Transportation (deaths)		103	101	80.7	48.7	22.8	8.74

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	14,373	15,986	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 (%)	2.64	7.26	9.83	18.3	38.7	64.6	80
Sales of space heating units - Electric Resistance (%)	2.48	3.43	3.58	4.11	5.42	7.07	8.03
Sales of space heating units - Fossil (%)	0	0.241	0.225	0.171	0.089	0.035	0.016
Sales of space heating units - Gas Furnace (%)	94.9	89.1	86.4	77.4	55.8	28.3	12
Sales of water heating units - Electric Heat Pump (%)	0.022	0.571	2.07	7.05	19	34.1	43.1
Sales of water heating units - Electric Resistance (%)	1.1	2	3.47	8.35	20.1	35.1	44
Sales of water heating units - Gas Furnace (%)	98.6	97	94.1	84.2	60.5	30.4	12.5
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383

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)		2.32	2.38	3.28	3.43	5.13	5.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	162	162	161	160	158	155	151

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Industry (PJ)	171	181	188	203	226	238	250
Final energy use - Residential (PJ)	237	229	225	220	212	196	175
Final energy use - Transportation (PJ)	472	446	410	379	355	326	292

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	4.41	4.7	0	0	0	0
Sales of cooking units - Electric Resistance (%)	50.3	51.6	56.1	68.1	84.8	95.1	98.7
Sales of cooking units - Gas (%)	49.7	48.4	43.9	31.9	15.2	4.9	1.32
Sales of space heating units - Electric Heat Pump (%)	5.62	13.3	15.8	24.3	44	68.4	82.7
Sales of space heating units - Electric Resistance (%)	7.65	13.9	13.5	12.5	10.1	6.84	4.95
Sales of space heating units - Fossil (%)	3.24	5.74	5.68	5.1	3.9	2.66	2.01
Sales of space heating units - Gas (%)	83.5	67.1	65	58.1	42	22.1	10.3
Sales of water heating units - Electric Heat Pump (%)	0	0.46	1.74	5.96	16.1	28.9	36.5
Sales of water heating units - Electric Resistance (%)	13.2	25.6	26.5	29.7	37.4	47.1	52.9
Sales of water heating units - Gas Furnace (%)	85.7	72.7	70.5	63.1	45.3	22.7	9.32
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.22	1.22	1.21

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	172	344	1,178	3,652	5,339
Public EV charging plugs - DC Fast (1000 units)	0.303	0	0.614	0	2.74	0	7.45
Public EV charging plugs - L2 (1000 units)	2.12	0	14.8	0	65.9	0	179
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 (%)	1.79	2.16	2.1	1.68	1.1	0.567	0.242
Vehicle sales - Light-duty - EV (%)	1.62	4.1	10.6	23.9	46.2	70.6	87
Vehicle sales - Light-duty - gasoline (%)	92.6	88.6	81.5	69.1	48.7	26.4	11.6
Vehicle sales - Light-duty - hybrid (%)	3.8	4.66	5.29	4.92	3.8	2.31	1.14
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.387	0.339	0.264	0.191	0.107	0.05
Vehicle sales - Light-duty - other (%)	0.113	0.116	0.107	0.094	0.069	0.038	0.017
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	0.009	0	0.042
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0.139	0	0.584

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	9	9	51
Biomass w/ccu power plant (GWh)	0	0	0	0	156	156	812

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	117	458	500
Conversion capital investment - Cumulative 5-yr (million $2018)	0	0	0	0	1,360	3,889	588
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	1	5	5
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	1	1	2
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	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 53: *E-B+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	3.38	5.08	10.2	11
Annual - BECCS (MMT)		0	0	0	1.72	6.72	7.4
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Annual - NGCC (MMT)		0	0	0.03	0.04	0.04	0.04
Cumulative - All (MMT)		0	0	3.38	8.46	18.6	29.6
Cumulative - BECCS (MMT)		0	0	0	1.72	8.44	15.8
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6
Cumulative - NGCC (MMT)		0	0	0.03	0.07	0.11	0.15

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	256	696	1,003	1,698	2,129
Cumulative investment - All (million $2018)		0	1,225	1,699	2,013	2,575	2,836
Cumulative investment - Spur (million $2018)		0	0.299	360	674	1,236	1,497
Cumulative investment - Trunk (million $2018)		0	1,225	1,339	1,339	1,339	1,339
Spur (km)		0	0.5	441	747	1,442	1,874
Trunk (km)		0	255	255	255	255	255

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	0	2.14	3.56	4.92	5.02
Injection wells (wells)		0	1	3	6	9	12
Resource characterization, appraisal, permitting costs (million $2020)		36	101	129	129	129	129
Wells and facilities construction costs (million $2020)		0	24	93.3	166	278	345

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)							-376
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,573
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)							-205
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,153
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-376
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,338
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)							-102
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,815
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							313
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,486
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							8.67
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							0.404
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							314
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,123

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 - Corn-ethanol to energy grasses (1000 hectares)							313
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,000
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							8.67
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							0.404
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							157
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,479

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)							-1,620
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-812
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-34,021
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,092
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
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)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
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)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		220	0.263	0.262	0.198	0.123	0.001
Monetary damages from air pollution - Natural Gas (million 2019$)		270	196	170	148	82.5	20.2
Monetary damages from air pollution - Transportation (million 2019$)		929	987	1,006	945	783	556
Premature deaths from air pollution - Coal (deaths)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Natural Gas (deaths)		30.5	22.1	19.2	16.7	9.32	2.28
Premature deaths from air pollution - Transportation (deaths)		104	111	113	106	88	62.5

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	14,192	14,841	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 (%)	2.64	13.8	46.2	73.2	77.9	78.5	78.5
Sales of space heating units - Electric Resistance (%)	2.48	4.35	8.94	16	20.3	21	21
Sales of space heating units - Fossil (%)	0	0.226	0.135	0.038	0.005	0	0
Sales of space heating units - Gas Furnace (%)	94.9	81.6	44.8	10.8	1.79	0.573	0.499
Sales of water heating units - Electric Heat Pump (%)	0.022	0.03	0.03	0.03	0.03	0.03	0.03
Sales of water heating units - Electric Resistance (%)	1.1	1.47	1.47	1.48	1.46	1.48	1.47
Sales of water heating units - Gas Furnace (%)	98.6	98.1	98.1	98.1	98.1	98.1	98.1
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383

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)		2.52	2.6	3.5	3.68	4	4.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	162	165	169	170	172	177	185
Final energy use - Industry (PJ)	171	186	198	211	225	243	262
Final energy use - Residential (PJ)	237	231	230	232	235	240	244
Final energy use - Transportation (PJ)	472	451	423	407	409	422	438

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	4.33	4.39	0	0	0	0
Sales of cooking units - Electric Resistance (%)	49.8	49.8	49.8	49.8	49.8	49.8	49.8
Sales of cooking units - Gas (%)	50.2	50.2	50.2	50.2	50.2	50.2	50.2
Sales of space heating units - Electric Heat Pump (%)	5.05	16.1	16.5	17	17.5	17.9	18.5
Sales of space heating units - Electric Resistance (%)	7.73	13.4	13.3	13.2	13.1	12.7	12.1
Sales of space heating units - Fossil (%)	3.28	5.42	5.49	5.36	5.12	5.04	5.13
Sales of space heating units - Gas (%)	83.9	65	64.8	64.4	64.3	64.4	64.2
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	13.2	25.2	25.3	25.3	25.4	25.4	25.4
Sales of water heating units - Gas Furnace (%)	85.7	73.5	73.5	73.5	73.4	73.4	73.4
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.22	1.22	1.22

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
Vehicle sales - Heavy-duty - other (%)	1.51	1.31	1.57	2.37	3.69	5.71	7.57
Vehicle sales - Light-duty - diesel (%)	1.78	2.16	2.22	2.07	1.87	1.75	1.66
Vehicle sales - Light-duty - EV (%)	2.81	4.63	5.31	6.47	7.94	9.34	10.5
Vehicle sales - Light-duty - gasoline (%)	91.5	88.1	86.4	84.8	82.9	81	79.3
Vehicle sales - Light-duty - hybrid (%)	3.7	4.58	5.63	6.22	6.84	7.52	8.12
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.385	0.359	0.323	0.322	0.324	0.336
Vehicle sales - Light-duty - other (%)	0.112	0.116	0.113	0.114	0.114	0.113	0.116
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)							-1,620
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-812
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-34,021
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,092
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
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)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804

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 - Improve plantations (1000 hectares)							4.95
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)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
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)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582

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)	6.25		4.02				1.15
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.047		-0.099				-0.104
Business-as-usual carbon sink - Total (Mt CO2e/y)	6.2		3.93				1.05

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		504	245	139	109	95.5	91.7
Monetary damages from air pollution - Natural Gas (million 2019$)		298	312	304	226	187	74
Monetary damages from air pollution - Transportation (million 2019$)		927	999	1,069	1,143	1,217	1,293
Premature deaths from air pollution - Coal (deaths)		56.9	27.7	15.7	12.3	10.8	10.4
Premature deaths from air pollution - Natural Gas (deaths)		33.6	35.3	34.3	25.5	21.1	8.35
Premature deaths from air pollution - Transportation (deaths)		104	112	120	129	137	145