Net-Zero America - massachusetts state report

2021-03-15

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

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

Notes

- These data are 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)		13,317	14,546				
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump (%)	4.31	10.7	38.6	72.2	77.8	78.1	78.1
Sales of space heating units - Electric Resistance (%)	2.07	4.58	16.4	21.3	21.9	21.9	21.9
Sales of space heating units - Fossil (%)	23.7	29.9	5.74	0.244	0	0	0
Sales of space heating units - Gas Furnace (%)	69.9	54.9	39.2	6.26	0.372	0	0
Sales of water heating units - Electric Heat Pump (%)	2.04	3.48	15.8	41.1	45.6	46	45.9
Sales of water heating units - Electric Resistance (%)	10.2	12.4	23.9	48	52.3	52.5	52.5
Sales of water heating units - Gas Furnace (%)	84.8	80.4	58.4	9.31	0.551	0	0
Sales of water heating units - Other (%)	2.99	3.76	1.89	1.58	1.56	1.56	1.58

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)		2.59	2.67	6.63	7.17	6.63	7.04

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	253	241	230	215	199	188	181
Final energy use - Industry (PJ)	81.4	79.3	79.4	79.4	80.6	81.8	83.4
Final energy use - Residential (PJ)	286	269	250	218	185	159	144
Final energy use - Transportation (PJ)	500	466	414	349	289	250	231

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)		5.62	6.19				
Sales of cooking units - Electric Resistance (%)	64.1	71.7	95.2	99.8	100	100	100
Sales of cooking units - Gas (%)	35.9	28.3	4.84	0.243	0	0	0
Sales of space heating units - Electric Heat Pump (%)	6.91	13.1	53.5	87.8	93.1	93.4	93.4
Sales of space heating units - Electric Resistance (%)	6.17	9.15	7.14	3.07	2.34	2.27	2.46
Sales of space heating units - Fossil (%)	32.4	41.6	13.8	4.85	4.07	4.05	3.91
Sales of space heating units - Gas (%)	54.5	36.2	25.6	4.29	0.5	0.264	0.249
Sales of water heating units - Electric Heat Pump (%)	0	1.22	12.2	31.8	35.2	35.4	35.4
Sales of water heating units - Electric Resistance (%)	30.5	48.9	54.7	62.9	64.4	64.5	64.5
Sales of water heating units - Gas Furnace (%)	60	44.2	31.9	5.09	0.3	0	0
Sales of water heating units - Other (%)	9.47	5.72	1.16	0.145	0.102	0.103	0.103

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)		962	2,495	3,997	6,074	6,591	6,294
Public EV charging plugs - DC Fast (1000 units)	0.317		1.49		6.24		10
Public EV charging plugs - L2 (1000 units)	2.26		35.7		150		241
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 (%)	1.4	1.68	1.2	0.382	0.072	0.013	0
Vehicle sales - Light-duty - EV (%)	4.41	16.7	48.7	82.7	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.1	76.3	46.4	15.6	3.17	0.586	0
Vehicle sales - Light-duty - hybrid (%)	4.9	4.89	3.38	1.24	0.304	0.067	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.331	0.191	0.059	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.095	0.091	0.058	0.02	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	1.13	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0.005	0.001	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0.006	0	0.001	0	0.015
Capital invested - Offshore Wind - Base (billion $2018)		1.95	8.25	14.1	18.8	9.71	0.655
Capital invested - Offshore Wind - Constrained (billion $2018)		0	8.66	15.6	15	0	4.55
Capital invested - Solar PV - Base (billion $2018)		0	1.33	1.91	4.38	5.83	0
Capital invested - Solar PV - Constrained (billion $2018)		0.202	0.495	3.92	2.72	7.22	0
Capital invested - Wind - Base (billion $2018)		0.105	1.71	0.488	0.32	0	0.218
Capital invested - Wind - Constrained (billion $2018)		0.105	1.92	0.167	0.279	0.17	0.21
Installed renewables - OffshoreWind - Base land use assumptions (MW)	70.3	758	3,920	10,140	19,410	25,645	26,167
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	70.3	758	3,920	10,140	19,410	25,645	26,167
Installed renewables - Rooftop PV (MW)	2,978	5,185	6,070	7,104	8,278	9,583	11,044
Installed renewables - Solar - Base land use assumptions (MW)	694	694	1,998	4,023	8,962	15,915	15,915
Installed renewables - Solar - Constrained land use assumptions (MW)	0	0	2,362	5,812	10,661	19,695	19,695
Installed renewables - Wind - Base land use assumptions (MW)	125	165	878	1,096	1,247	1,247	1,361
Installed renewables - Wind - Constrained land use assumptions (MW)	125	165	964	1,082	1,170	1,254	1,397

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	2,220	2,220	2,220	2,220	2,220
Biomass w/ccu allam power plant (GWh)	0	0	0	5.42	6.26	6.26	6.26
Biomass w/ccu power plant (GWh)	0	0	6.99	6.99	7.72	7.72	24.1
OffshoreWind - Base land use assumptions (GWh)	282	3,054	15,934	42,263	81,669	108,977	111,425
OffshoreWind - Constrained land use assumptions (GWh)	282	3,054	15,934	42,263	81,669	108,977	111,425
Solar - Base land use assumptions (GWh)	744	744	2,706	5,783	13,162	23,466	23,466
Solar - Constrained land use assumptions (GWh)	0	0	3,587	8,733	15,925	29,321	29,321
Wind - Base land use assumptions (GWh)	502	655	3,259	4,034	4,572	4,572	4,977
Wind - Constrained land use assumptions (GWh)	502	655	3,559	3,981	4,288	4,586	5,084

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0	73.3	74.6	75	75.5	151
Conversion capital investment - Cumulative 5-yr (million $2018)		0	1,267	43.3	12.5	12.6	2,040
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	1	1	2
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Power (quantity)	0	0	2	2	2	2	2
Number of facilities - Power ccu (quantity)	0	0	1	1	1	1	2
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	2
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	1	1	2
Number of facilities - Sng (quantity)	0	0	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.01	0.02	0.03	0.03	1.32
Annual - BECCS (MMT)		0	0.01	0.02	0.02	0.02	1.31
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0.01	0.01	0	0.01
Cumulative - All (MMT)		0	0.01	0.03	0.06	0.09	1.41
Cumulative - BECCS (MMT)		0	0.01	0.03	0.05	0.07	1.38
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0.01	0.02	0.02	0.03

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	171	314	314	314	549
Cumulative investment - All (million $2018)		0	264	339	339	339	494
Cumulative investment - Spur (million $2018)		0	19.1	94.2	94.2	94.2	249
Cumulative investment - Trunk (million $2018)		0	245	245	245	245	245
Spur (km)		0	36.2	179	179	179	414
Trunk (km)		0	135	135	135	135	135

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

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

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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-105
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-3.29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-109
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-55
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-1.64
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-56.7
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							63.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							5.98
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							69.5
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							33.2
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							2.99
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							36.2

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)							-36.4
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-4,728
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,146
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,955
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-518
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-210
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-307
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-555
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,417
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-191
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-751
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-173
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-73.7
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-23.3
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-187
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-27.4
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,072
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-669
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,353
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-345
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-142
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-165
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-371

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 - Accelerate regeneration (1000 hectares)							5.96
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							155
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							997
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							0
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)							20
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							8.73
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							184
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,371
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							2.98
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							146
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							382
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							0
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)							10.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							1.51
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							111
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							654
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.47

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 - Avoid deforestation (over 30 years) (1000 hectares)							150
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							689
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							0
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)							15.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							10.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							224
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,095

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		340	286	230	173	109	75.5
Natural gas consumption - Cumulative (tcf)							6,921
Natural gas production - Annual (tcf)		0	0	0	0	0	0
Oil consumption - Annual (million bbls)		88.4	76.2	58.5	42.2	29.3	19.2
Oil consumption - Cumulative (million bbls)							1,813
Oil production - Annual (million bbls)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		557	0.598	0.597	0.568	0.345	0.018
Monetary damages from air pollution - Natural Gas (million 2019$)		288	155	107	108	66.1	35.6
Monetary damages from air pollution - Transportation (million 2019$)		2,027	1,872	1,408	804	356	128
Premature deaths from air pollution - Coal (deaths)		62.9	0.068	0.067	0.064	0.039	0.002
Premature deaths from air pollution - Natural Gas (deaths)		32.5	17.5	12.1	12.2	7.46	4.02
Premature deaths from air pollution - Transportation (deaths)		228	211	158	90.4	40	14.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		112	304	293	247	198	283
By economic sector - Construction (jobs)		13,426	11,963	16,967	24,459	25,943	26,720
By economic sector - Manufacturing (jobs)		4,933	8,934	9,220	11,052	14,311	19,224
By economic sector - Mining (jobs)		1,719	1,228	795	484	273	151

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		2,212	1,664	2,324	3,509	4,214	5,723
By economic sector - Pipeline (jobs)		423	387	281	208	135	113
By economic sector - Professional (jobs)		5,017	5,504	8,234	12,721	14,433	16,236
By economic sector - Trade (jobs)		3,698	3,519	4,916	7,459	8,665	10,294
By economic sector - Utilities (jobs)		5,496	8,636	14,907	22,673	22,600	18,210
By education level - All sectors - Associates degree or some college (jobs)		11,757	13,447	18,695	26,901	29,456	31,307
By education level - All sectors - Bachelors degree (jobs)		7,188	8,334	11,372	16,322	18,044	19,500
By education level - All sectors - Doctoral degree (jobs)		266	281	395	588	660	738
By education level - All sectors - High school diploma or less (jobs)		16,095	18,089	24,679	34,909	38,093	40,553
By education level - All sectors - Masters or professional degree (jobs)		1,732	1,987	2,797	4,092	4,518	4,857
By resource sector - Biomass (jobs)		482	839	834	744	722	1,210
By resource sector - CO2 (jobs)		0	243	2.22	5.64	5.63	185
By resource sector - Grid (jobs)		7,278	14,160	28,053	42,603	43,034	34,301
By resource sector - Natural Gas (jobs)		4,338	3,538	2,624	3,481	2,501	1,473
By resource sector - Nuclear (jobs)		0	0.012	0.027	0.03	0.058	0.074
By resource sector - Oil (jobs)		3,930	3,107	2,204	1,475	957	589
By resource sector - Solar (jobs)		20,140	14,280	13,698	18,680	24,790	34,338
By resource sector - Wind (jobs)		870	5,971	10,522	15,823	18,760	24,859
Median wages - Annual - All ($2019 per job)		67,705	68,862	70,930	72,487	73,095	72,989
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		6,120	6,920	9,628	13,822	15,048	15,833
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		2,637	2,822	4,051	5,910	6,327	6,464
On-Site or In-Plant Training - Total jobs - None (jobs)		6,096	6,877	9,350	13,353	14,750	16,036
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		319	366	521	756	819	849
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		21,864	25,155	34,388	48,971	53,826	57,773
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,880	8,903	12,435	17,900	19,465	20,415
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,627	2,788	4,037	5,911	6,320	6,438
On-the-Job Training - All sectors - None (jobs)		2,083	2,268	3,077	4,391	4,854	5,313
On-the-Job Training - All sectors - Over 10 years (jobs)		394	431	560	782	871	969
On-the-Job Training - All sectors - Up to 1 year (jobs)		24,053	27,749	37,829	53,828	59,261	63,819
Related work experience - All sectors - 1 to 4 years (jobs)		13,171	15,037	20,733	29,684	32,503	34,617
Related work experience - All sectors - 4 to 10 years (jobs)		8,555	9,755	13,502	19,403	21,222	22,501
Related work experience - All sectors - None (jobs)		5,371	6,087	8,415	12,040	13,142	13,964
Related work experience - All sectors - Over 10 years (jobs)		2,225	2,617	3,564	5,074	5,593	5,992
Related work experience - All sectors - Up to 1 year (jobs)		7,714	8,643	11,725	16,611	18,310	19,879
Wage income - All (million $2019)		2,508	2,902	4,110	6,004	6,636	7,078

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)		13,315	14,553				
Sales of cooking units - Electric Resistance (%)	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Sales of space heating units - Electric Heat Pump (%)	4.31	7.58	10.8	20.7	40.6	61.6	72.9
Sales of space heating units - Electric Resistance (%)	2.07	2.47	3.76	7.71	14.2	19.1	21
Sales of space heating units - Fossil (%)	23.7	34.5	32.4	24.4	11.9	3.8	0.998
Sales of space heating units - Gas Furnace (%)	69.9	55.4	53.1	47.2	33.3	15.5	5.06
Sales of water heating units - Electric Heat Pump (%)	2.04	2.9	4.29	8.99	20.1	34	42
Sales of water heating units - Electric Resistance (%)	10.2	11.8	12.9	17.6	28.1	41.1	48.8
Sales of water heating units - Gas Furnace (%)	84.8	81.2	79	70.2	49.4	23.1	7.53
Sales of water heating units - Other (%)	2.99	4.09	3.78	3.24	2.41	1.82	1.65

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)		1.91	1.91	3.04	3.17	5.62	6.03

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	253	241	235	230	223	216	207
Final energy use - Industry (PJ)	81.4	79.4	79.8	80.8	82.8	83.9	85.2
Final energy use - Residential (PJ)	286	270	259	248	231	207	181
Final energy use - Transportation (PJ)	501	471	433	400	373	341	304

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)		5.63	6.47				
Sales of cooking units - Electric Resistance (%)	64	64.9	68.2	76.9	89	96.4	99
Sales of cooking units - Gas (%)	36	35.1	31.8	23.1	11	3.56	0.957
Sales of space heating units - Electric Heat Pump (%)	6.91	7.36	12	26	51.8	76	88
Sales of space heating units - Electric Resistance (%)	6.17	9.22	8.85	8.12	6.41	4.13	2.94
Sales of space heating units - Fossil (%)	32.4	46.7	43.8	34.6	19.9	9.61	5.55
Sales of space heating units - Gas (%)	54.5	36.7	35.3	31.3	21.9	10.3	3.54
Sales of water heating units - Electric Heat Pump (%)	0	0.459	1.73	5.83	15.1	26.1	32.4
Sales of water heating units - Electric Resistance (%)	30.5	48.3	49	51.2	55.6	60.5	63.2
Sales of water heating units - Gas Furnace (%)	60	44.6	43.2	38.4	27	12.6	4.1
Sales of water heating units - Other (%)	9.47	6.6	6.08	4.62	2.32	0.811	0.288

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	161	327	1,113	3,470	5,067
Public EV charging plugs - DC Fast (1000 units)	0.317		0.499		2.34		6.43
Public EV charging plugs - L2 (1000 units)	2.26		12		56.3		154
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 (%)	1.41	1.85	2.03	1.61	1.02	0.519	0.223
Vehicle sales - Light-duty - EV (%)	2.06	5.07	12.6	27.1	49.7	72.9	87.9
Vehicle sales - Light-duty - gasoline (%)	91.2	86.7	78.4	65.1	44.7	23.9	10.6
Vehicle sales - Light-duty - hybrid (%)	5.1	5.88	6.54	5.88	4.34	2.52	1.21
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.376	0.317	0.239	0.168	0.092	0.043
Vehicle sales - Light-duty - other (%)	0.097	0.1	0.09	0.078	0.056	0.03	0.014
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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-105
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-3.29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-109
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-55
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-1.64
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-56.7
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							63.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							5.98

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							69.5
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							33.2
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							2.99
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							36.2

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)							-36.4
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-4,728
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,146
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,955
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-518
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-210
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-307
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-555
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,417
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-191
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-751
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-173
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-73.7
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-23.3
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-187
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-27.4

Table 23: *E- 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)							-3,072
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-669
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,353
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-345
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-142
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-165
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-371
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							5.96
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							155
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							997
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							0
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)							20
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							8.73
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							184
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,371
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							2.98
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							146
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							382
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0

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 - Increase trees outside forests (1000 hectares)							10.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							1.51
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							111
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							654
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							150
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							689
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							0
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)							15.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							10.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							224
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,095

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		557	0.598	0.597	0.568	0.345	0.018
Monetary damages from air pollution - Natural Gas (million 2019$)		284	123	47.3	19.9	5.97	9.82
Monetary damages from air pollution - Transportation (million 2019$)		2,064	2,069	1,991	1,771	1,392	941
Premature deaths from air pollution - Coal (deaths)		62.9	0.068	0.067	0.064	0.039	0.002
Premature deaths from air pollution - Natural Gas (deaths)		32	13.9	5.34	2.25	0.674	1.11
Premature deaths from air pollution - Transportation (deaths)		232	233	224	199	157	106

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)		13,317	14,546				
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump (%)	4.31	10.7	38.6	72.2	77.8	78.1	78.1
Sales of space heating units - Electric Resistance (%)	2.07	4.58	16.4	21.3	21.9	21.9	21.9
Sales of space heating units - Fossil (%)	23.7	29.9	5.74	0.244	0	0	0
Sales of space heating units - Gas Furnace (%)	69.9	54.9	39.2	6.26	0.372	0	0
Sales of water heating units - Electric Heat Pump (%)	2.04	3.48	15.8	41.1	45.6	46	45.9
Sales of water heating units - Electric Resistance (%)	10.2	12.4	23.9	48	52.3	52.5	52.5
Sales of water heating units - Gas Furnace (%)	84.8	80.4	58.4	9.31	0.551	0	0
Sales of water heating units - Other (%)	2.99	3.76	1.89	1.58	1.56	1.56	1.58

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)		2.59	2.67	6.63	7.17	6.63	7.04

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	253	241	230	215	199	188	181
Final energy use - Industry (PJ)	81.4	79.3	79.4	79.4	80.6	81.8	83.4
Final energy use - Residential (PJ)	286	269	250	218	185	159	144
Final energy use - Transportation (PJ)	500	466	414	349	289	250	231

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)		5.62	6.19				
Sales of cooking units - Electric Resistance (%)	64.1	71.7	95.2	99.8	100	100	100
Sales of cooking units - Gas (%)	35.9	28.3	4.84	0.243	0	0	0
Sales of space heating units - Electric Heat Pump (%)	6.91	13.1	53.5	87.8	93.1	93.4	93.4
Sales of space heating units - Electric Resistance (%)	6.17	9.15	7.14	3.07	2.34	2.27	2.46
Sales of space heating units - Fossil (%)	32.4	41.6	13.8	4.85	4.07	4.05	3.91
Sales of space heating units - Gas (%)	54.5	36.2	25.6	4.29	0.5	0.264	0.249
Sales of water heating units - Electric Heat Pump (%)	0	1.22	12.2	31.8	35.2	35.4	35.4
Sales of water heating units - Electric Resistance (%)	30.5	48.9	54.7	62.9	64.4	64.5	64.5
Sales of water heating units - Gas Furnace (%)	60	44.2	31.9	5.09	0.3	0	0
Sales of water heating units - Other (%)	9.47	5.72	1.16	0.145	0.102	0.103	0.103

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)		962	2,495	3,997	6,074	6,591	6,294
Public EV charging plugs - DC Fast (1000 units)	0.317		1.49		6.24		10
Public EV charging plugs - L2 (1000 units)	2.26		35.7		150		241
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 (%)	1.4	1.68	1.2	0.382	0.072	0.013	0
Vehicle sales - Light-duty - EV (%)	4.41	16.7	48.7	82.7	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.1	76.3	46.4	15.6	3.17	0.586	0
Vehicle sales - Light-duty - hybrid (%)	4.9	4.89	3.38	1.24	0.304	0.067	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.331	0.191	0.059	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.095	0.091	0.058	0.02	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 - Offshore Wind - Base (billion $2018)		1.72	8.25	26	18.5	2.74	0
Capital invested - Solar PV - Base (billion $2018)		0	2.48	4.94	8.24	2.04	0
Capital invested - Wind - Base (billion $2018)		0.105	1.71	0.488	0.32	0	0.218
Installed renewables - OffshoreWind - Base land use assumptions (MW)	70.3	678	3,840	15,289	24,408	26,167	26,167
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	0	6,483	30,784	35,104	35,104	42,364
Installed renewables - Solar - Base land use assumptions (MW)	694	694	3,124	8,366	17,647	20,077	20,077
Installed renewables - Solar - Constrained land use assumptions (MW)	1,387	1,387	6,022	12,277	22,785	26,924	26,924
Installed renewables - Wind - Base land use assumptions (MW)	125	165	878	1,096	1,247	1,247	1,361
Installed renewables - Wind - Constrained land use assumptions (MW)	250	330	1,929	2,165	2,340	2,509	3,021

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	282	2,728	15,604	63,855	103,414	111,425	111,425
OffshoreWind - Constrained land use assumptions (GWh)	0	0	26,329	129,043	148,281	148,281	180,138
Solar - Base land use assumptions (GWh)	744	744	4,409	12,176	25,995	29,584	29,584
Solar - Constrained land use assumptions (GWh)	1,489	1,489	8,456	17,820	33,440	39,534	39,534
Wind - Base land use assumptions (GWh)	502	655	3,259	4,034	4,572	4,572	4,977

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

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Constrained land use assumptions (GWh)	1,003	1,310	7,117	7,963	8,576	9,173	10,953

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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-105
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-3.29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-109
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-55
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-1.64
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-56.7
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							63.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							5.98
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							69.5
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							33.2
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							2.99
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							36.2

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)							-36.4
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-4,728
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,146

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,955
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-518
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-210
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-307
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-555
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,417
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-191
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-751
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-173
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-73.7
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-23.3
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-187
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-27.4
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,072
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-669
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,353
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-345
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-142
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-165
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-371
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							5.96
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							155

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 - High - Extend rotation length (1000 hectares)							997
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							0
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)							20
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							8.73
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							184
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,371
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							2.98
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							146
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							382
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							0
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)							10.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							1.51
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							111
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							654
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							150
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							689
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							0

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 - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							15.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							10.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							224
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,095

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		557	0.598	0.597	0.568	0.345	0.018
Monetary damages from air pollution - Natural Gas (million 2019$)		273	137	76.8	69.5	24	12.3
Monetary damages from air pollution - Transportation (million 2019$)		2,027	1,872	1,408	804	356	128
Premature deaths from air pollution - Coal (deaths)		62.9	0.068	0.067	0.064	0.039	0.002
Premature deaths from air pollution - Natural Gas (deaths)		30.8	15.5	8.67	7.84	2.71	1.39
Premature deaths from air pollution - Transportation (deaths)		228	211	158	90.4	40	14.3

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)		13,317	14,546				
Sales of cooking units - Electric Resistance (%)	36.9	49.9	81.2	87.4	87.7	87.7	87.7
Sales of cooking units - Gas (%)	63.1	50.1	18.8	12.6	12.3	12.3	12.3
Sales of space heating units - Electric Heat Pump (%)	4.31	10.7	38.6	72.2	77.8	78.1	78.1
Sales of space heating units - Electric Resistance (%)	2.07	4.58	16.4	21.3	21.9	21.9	21.9
Sales of space heating units - Fossil (%)	23.7	29.9	5.74	0.244	0	0	0
Sales of space heating units - Gas Furnace (%)	69.9	54.9	39.2	6.26	0.372	0	0
Sales of water heating units - Electric Heat Pump (%)	2.04	3.48	15.8	41.1	45.6	46	45.9
Sales of water heating units - Electric Resistance (%)	10.2	12.4	23.9	48	52.3	52.5	52.5
Sales of water heating units - Gas Furnace (%)	84.8	80.4	58.4	9.31	0.551	0	0
Sales of water heating units - Other (%)	2.99	3.76	1.89	1.58	1.56	1.56	1.58

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)		2.59	2.67	6.63	7.17	6.63	7.04

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	253	241	230	215	199	188	181
Final energy use - Industry (PJ)	81.4	79.3	79.4	79.4	80.6	81.8	83.4
Final energy use - Residential (PJ)	286	269	250	218	185	159	144
Final energy use - Transportation (PJ)	500	466	414	349	289	250	231

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)		5.62	6.19				
Sales of cooking units - Electric Resistance (%)	64.1	71.7	95.2	99.8	100	100	100
Sales of cooking units - Gas (%)	35.9	28.3	4.84	0.243	0	0	0
Sales of space heating units - Electric Heat Pump (%)	6.91	13.1	53.5	87.8	93.1	93.4	93.4
Sales of space heating units - Electric Resistance (%)	6.17	9.15	7.14	3.07	2.34	2.27	2.46
Sales of space heating units - Fossil (%)	32.4	41.6	13.8	4.85	4.07	4.05	3.91
Sales of space heating units - Gas (%)	54.5	36.2	25.6	4.29	0.5	0.264	0.249
Sales of water heating units - Electric Heat Pump (%)	0	1.22	12.2	31.8	35.2	35.4	35.4
Sales of water heating units - Electric Resistance (%)	30.5	48.9	54.7	62.9	64.4	64.5	64.5
Sales of water heating units - Gas Furnace (%)	60	44.2	31.9	5.09	0.3	0	0
Sales of water heating units - Other (%)	9.47	5.72	1.16	0.145	0.102	0.103	0.103

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)		962	2,495	3,997	6,074	6,591	6,294
Public EV charging plugs - DC Fast (1000 units)	0.317		1.49		6.24		10
Public EV charging plugs - L2 (1000 units)	2.26		35.7		150		241
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 (%)	1.4	1.68	1.2	0.382	0.072	0.013	0
Vehicle sales - Light-duty - EV (%)	4.41	16.7	48.7	82.7	96.4	99.3	100
Vehicle sales - Light-duty - gasoline (%)	89.1	76.3	46.4	15.6	3.17	0.586	0
Vehicle sales - Light-duty - hybrid (%)	4.9	4.89	3.38	1.24	0.304	0.067	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.331	0.191	0.059	0.012	0.002	0
Vehicle sales - Light-duty - other (%)	0.095	0.091	0.058	0.02	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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 - Offshore Wind - Base (billion $2018)		6.33	5.44	6.44	2.81	1.2	1.44
Capital invested - Offshore Wind - Constrained (billion $2018)		3.86	6.35	7.03	2.97	1.19	1.97
Capital invested - Solar PV - Base (billion $2018)		0.489	1.5	0.551	0.859	0.368	1.16
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0	0	1.24	1.34
Capital invested - Wind - Base (billion $2018)		0.105	0.866	0	0	0	0.67
Capital invested - Wind - Constrained (billion $2018)		0.105	0.871	0	0	0.229	0.615
Installed renewables - OffshoreWind - Base land use assumptions (MW)	70.3	2,304	4,387	7,217	8,604	9,372	10,524
Installed renewables - OffshoreWind - Constrained land use assumptions (MW)	0	1,364	3,797	6,889	8,356	9,123	10,698
Installed renewables - Solar - Base land use assumptions (MW)	694	1,121	2,584	3,169	4,136	4,575	6,037
Installed renewables - Solar - Constrained land use assumptions (MW)	1,908	1,908	1,908	1,908	1,908	3,382	5,074
Installed renewables - Wind - Base land use assumptions (MW)	125	165	526	526	526	526	878
Installed renewables - Wind - Constrained land use assumptions (MW)	125	165	528	528	528	642	964

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

Item	2020	2025	2030	2035	2040	2045	2050
OffshoreWind - Base land use assumptions (GWh)	282	9,335	17,830	29,632	35,720	39,074	43,861
OffshoreWind - Constrained land use assumptions (GWh)	0	5,479	15,454	28,171	34,272	37,485	44,149
Solar - Base land use assumptions (GWh)	744	1,390	3,583	4,461	5,906	6,565	8,762
Solar - Constrained land use assumptions (GWh)	2,577	2,577	2,577	2,577	2,577	4,764	7,272
Wind - Base land use assumptions (GWh)	502	655	1,991	1,991	1,991	1,991	3,259
Wind - Constrained land use assumptions (GWh)	502	655	2,000	2,000	2,000	2,407	3,559

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)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-105
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-3.29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-109

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-55
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-1.64
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-56.7
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							63.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							5.98
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							69.5
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							33.2
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							2.99
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							36.2

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)							-36.4
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-4,728
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,146
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,955
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-518
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-210
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-307
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-555
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,417
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-191
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-751
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-173
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-73.7
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-23.3
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-187
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-27.4
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,072
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-669
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,353
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-345
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-142
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-165
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-371
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							5.96
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							155
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							997
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							0
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)							20
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							8.73

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 - Restore productivity (1000 hectares)							184
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,371
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							2.98
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							146
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							382
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							0
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)							10.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							1.51
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							111
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							654
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							150
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							689
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							0
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)							15.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							10.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							224
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,095

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		557	0.598	0.597	0.568	0.345	0.018
Monetary damages from air pollution - Natural Gas (million 2019$)		286	161	172	129	66.5	15.4
Monetary damages from air pollution - Transportation (million 2019$)		2,027	1,872	1,408	804	356	128
Premature deaths from air pollution - Coal (deaths)		62.9	0.068	0.067	0.064	0.039	0.002
Premature deaths from air pollution - Natural Gas (deaths)		32.3	18.1	19.4	14.5	7.5	1.74
Premature deaths from air pollution - Transportation (deaths)		228	211	158	90.4	40	14.3

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)		13,315	14,553				
Sales of cooking units - Electric Resistance (%)	36.9	40.7	44.7	56.5	72.7	82.9	86.4
Sales of cooking units - Gas (%)	63.1	59.3	55.3	43.5	27.3	17.1	13.6
Sales of space heating units - Electric Heat Pump (%)	4.31	7.58	10.8	20.7	40.6	61.6	72.9
Sales of space heating units - Electric Resistance (%)	2.07	2.47	3.76	7.71	14.2	19.1	21
Sales of space heating units - Fossil (%)	23.7	34.5	32.4	24.4	11.9	3.8	0.998
Sales of space heating units - Gas Furnace (%)	69.9	55.4	53.1	47.2	33.3	15.5	5.06
Sales of water heating units - Electric Heat Pump (%)	2.04	2.9	4.29	8.99	20.1	34	42
Sales of water heating units - Electric Resistance (%)	10.2	11.8	12.9	17.6	28.1	41.1	48.8
Sales of water heating units - Gas Furnace (%)	84.8	81.2	79	70.2	49.4	23.1	7.53
Sales of water heating units - Other (%)	2.99	4.09	3.78	3.24	2.41	1.82	1.65

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)		1.91	1.91	3.04	3.17	5.62	6.03

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	253	241	235	230	223	216	207
Final energy use - Industry (PJ)	81.4	79.4	79.8	80.8	82.8	83.9	85.2
Final energy use - Residential (PJ)	286	270	259	248	231	207	181
Final energy use - Transportation (PJ)	501	471	433	400	373	341	304

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)		5.63	6.47				
Sales of cooking units - Electric Resistance (%)	64	64.9	68.2	76.9	89	96.4	99
Sales of cooking units - Gas (%)	36	35.1	31.8	23.1	11	3.56	0.957
Sales of space heating units - Electric Heat Pump (%)	6.91	7.36	12	26	51.8	76	88

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Resistance (%)	6.17	9.22	8.85	8.12	6.41	4.13	2.94
Sales of space heating units - Fossil (%)	32.4	46.7	43.8	34.6	19.9	9.61	5.55
Sales of space heating units - Gas (%)	54.5	36.7	35.3	31.3	21.9	10.3	3.54
Sales of water heating units - Electric Heat Pump (%)	0	0.459	1.73	5.83	15.1	26.1	32.4
Sales of water heating units - Electric Resistance (%)	30.5	48.3	49	51.2	55.6	60.5	63.2
Sales of water heating units - Gas Furnace (%)	60	44.6	43.2	38.4	27	12.6	4.1
Sales of water heating units - Other (%)	9.47	6.6	6.08	4.62	2.32	0.811	0.288

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	161	327	1,113	3,470	5,067
Public EV charging plugs - DC Fast (1000 units)	0.317		0.499		2.34		6.43
Public EV charging plugs - L2 (1000 units)	2.26		12		56.3		154
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 (%)	1.41	1.85	2.03	1.61	1.02	0.519	0.223
Vehicle sales - Light-duty - EV (%)	2.06	5.07	12.6	27.1	49.7	72.9	87.9
Vehicle sales - Light-duty - gasoline (%)	91.2	86.7	78.4	65.1	44.7	23.9	10.6
Vehicle sales - Light-duty - hybrid (%)	5.1	5.88	6.54	5.88	4.34	2.52	1.21
Vehicle sales - Light-duty - hydrogen FC (%)	0.112	0.376	0.317	0.239	0.168	0.092	0.043
Vehicle sales - Light-duty - other (%)	0.097	0.1	0.09	0.078	0.056	0.03	0.014
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	0.403	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0.006	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0.006	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	792	792	792	792	792
Biomass w/ccu allam power plant (GWh)	0	0	0	5.53	5.81	6.24	6.24
Biomass w/ccu power plant (GWh)	0	0	7.09	7.09	7.22	7.57	7.57

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass purchases (million $2018/year)		0	48.1	52	54.9	56.1	376
Conversion capital investment - Cumulative 5-yr (million $2018)		0	456	66.9	44.2	19.3	4,630
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	1	1	2
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Power (quantity)	0	0	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	1	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	3
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Sng (quantity)	0	0	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.01	0.02	0.03	0.03	2.76
Annual - BECCS (MMT)		0	0.01	0.02	0.02	0.02	2.75
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0	0	0	0.01
Cumulative - All (MMT)		0	0.01	0.03	0.06	0.09	2.85
Cumulative - BECCS (MMT)		0	0.01	0.03	0.05	0.07	2.82
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0	0	0	0.01

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	171	314	314	314	393
Cumulative investment - All (million $2018)		0	264	339	339	339	407
Cumulative investment - Spur (million $2018)		0	19.1	94.2	94.2	94.2	162
Cumulative investment - Trunk (million $2018)		0	245	245	245	245	245
Spur (km)		0	36.2	179	179	179	257
Trunk (km)		0	135	135	135	135	135

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

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

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)							0

Table 56: *E-B+ 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)							-105
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)							-3.29
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-109
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-55
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)							-1.64
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-56.7
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							157
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							1.5
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							5.98
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							164
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							33.2
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							1.5

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 - Permanent conservation cover (1000 hectares)							2.99
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							37.7

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)							-36.4
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-4,728
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,146
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,955
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-518
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-210
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-307
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-555
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,417
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-191
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-751
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-173
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-73.7
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-23.3
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-187
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-27.4
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,072
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-669
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,353
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-345

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-142
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-165
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-371
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							5.96
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							155
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							997
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							0
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)							20
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							8.73
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							184
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,371
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							2.98
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							146
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							382
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							0
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)							10.5
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							1.51
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							111

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 - Total impacted (over 30 years) (1000 hectares)							654
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							150
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							689
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							0
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)							15.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							10.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							224
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,095

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		557	0.598	0.597	0.568	0.345	0.018
Monetary damages from air pollution - Natural Gas (million 2019$)		283	116	54.9	43.4	26.5	14.5
Monetary damages from air pollution - Transportation (million 2019$)		2,064	2,069	1,991	1,771	1,392	941
Premature deaths from air pollution - Coal (deaths)		62.9	0.068	0.067	0.064	0.039	0.002
Premature deaths from air pollution - Natural Gas (deaths)		32	13.1	6.2	4.9	2.99	1.63
Premature deaths from air pollution - Transportation (deaths)		232	233	224	199	157	106

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)		13,153	13,534				
Sales of cooking units - Electric Resistance (%)	36.9	39	38.6	38.5	38.3	38.5	38.4
Sales of cooking units - Gas (%)	63.1	61	61.4	61.5	61.7	61.5	61.6
Sales of space heating units - Electric Heat Pump (%)	4.31	12.9	41	64	67.7	68.1	68.2
Sales of space heating units - Electric Resistance (%)	2.07	2.89	7.66	20	30.1	31.7	31.8
Sales of space heating units - Fossil (%)	23.7	33.3	23.6	9.31	1.33	0.106	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Gas Furnace (%)	69.9	50.9	27.8	6.73	0.854	0.047	0
Sales of water heating units - Electric Heat Pump (%)	2.04	2.38	2.35	2.36	2.34	2.36	2.35
Sales of water heating units - Electric Resistance (%)	10.2	11.3	11.1	11.3	11.2	11.1	11.1
Sales of water heating units - Gas Furnace (%)	84.8	82.1	82.5	82.3	82.3	82.6	82.5
Sales of water heating units - Other (%)	2.99	4.16	4.05	4.05	4.14	3.96	4.03

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)		1.9	1.89	4.44	4.74	4.91	5.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	253	246	249	250	251	258	269
Final energy use - Industry (PJ)	81.4	81.9	84.8	88.8	94.4	99.2	104
Final energy use - Residential (PJ)	286	272	264	261	258	256	255
Final energy use - Transportation (PJ)	501	474	444	426	429	442	458

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)		5.48	5.7				
Sales of cooking units - Electric Resistance (%)	63.6	63.6	63.6	63.6	63.6	63.6	63.6
Sales of cooking units - Gas (%)	36.4	36.4	36.4	36.4	36.4	36.4	36.4
Sales of space heating units - Electric Heat Pump (%)	6.66	9.84	10.2	10.6	10.9	11.2	11.6
Sales of space heating units - Electric Resistance (%)	6.21	8.92	8.73	8.57	8.52	8.08	7.76
Sales of space heating units - Fossil (%)	32.5	40.9	22.6	9.73	8.85	8.82	8.8
Sales of space heating units - Gas (%)	54.6	40.4	58.5	71.1	71.7	71.9	71.8
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	30.5	48.1	48.1	48.2	48.2	48.2	48.2
Sales of water heating units - Gas Furnace (%)	60	45.1	45.1	45	45	45	45
Sales of water heating units - Other (%)	9.47	6.78	6.78	6.83	6.83	6.84	6.85

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 (%)	1.4	1.84	2.16	2.01	1.81	1.68	1.6
Vehicle sales - Light-duty - EV (%)	4.05	6.23	7.05	8.7	10.6	12.1	13.3
Vehicle sales - Light-duty - gasoline (%)	89.4	85.7	83.4	81.3	79.2	77.3	75.8
Vehicle sales - Light-duty - hybrid (%)	4.92	5.75	7	7.55	8.08	8.59	8.94

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC (%)	0.11	0.372	0.337	0.298	0.293	0.293	0.303
Vehicle sales - Light-duty - other (%)	0.095	0.099	0.095	0.096	0.095	0.094	0.096
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)							-36.4
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-4,728
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,146
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,955
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-518
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-210
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-307
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-555
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-1,417
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-191
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-751
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-173
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-73.7
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-23.3
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-187
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-27.4
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-3,072
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-669

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,353
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-345
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-142
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-165
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-371
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							5.96
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							155
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							997
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							0
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)							20
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							8.73
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							184
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							1,371
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							2.98
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							146
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							382
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							0
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)							10.5

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 - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							1.51
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							111
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							654
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							4.47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							150
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							689
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							0
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)							15.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							10.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							224
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,095

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)	-4.85		-2.63				-2.35
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.141		-0.253				-0.263
Business-as-usual carbon sink - Total (Mt CO2e/y)	-4.99		-2.89				-2.62

Table 66: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019$)		1,560	979	909	885	867	767
Monetary damages from air pollution - Natural Gas (million 2019$)		223	162	211	251	229	208
Monetary damages from air pollution - Transportation (million 2019$)		2,059	2,091	2,116	2,147	2,176	2,204
Premature deaths from air pollution - Coal (deaths)		176	111	103	100	98	86.7
Premature deaths from air pollution - Natural Gas (deaths)		25.2	18.3	23.8	28.4	25.8	23.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Transportation (deaths)		232	235	238	242	245	248