



Net-Zero America - montana 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.

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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	2,913	3,241	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 (%)	1.5	8.17	31.2	81.3	90.2	90.8	90.8
Sales of space heating units - Electric Resistance (%)	1.52	3.43	4.91	8.08	8.65	8.7	8.7
Sales of space heating units - Fossil (%)	0.745	0.218	0.042	0.002	0	0	0
Sales of space heating units - Gas Furnace (%)	96.2	88.2	63.9	10.6	1.1	0.5	0.497
Sales of water heating units - Electric Heat Pump (%)	0.014	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	0.703	2.51	15.8	44.8	50.1	50.4	50.4
Sales of water heating units - Gas Furnace (%)	99.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.168	0.382	0.381	0.382	0.381	0.382	0.382

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)		0.684	0.713	1.5	1.62	1.36	1.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.7	39.7	38.9	36.8	34.2	32.3	31.5
Final energy use - Industry (PJ)	59.8	61.8	62	63.1	66.8	68.2	69.6
Final energy use - Residential (PJ)	52.9	50.4	48	42.8	36.5	31.6	28.2
Final energy use - Transportation (PJ)	114	107	94.2	79	65.2	56.7	53

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	0.766	0.814	0	0	0	0
Sales of cooking units - Electric Resistance (%)	45.7	57.3	92.7	99.6	100	100	100
Sales of cooking units - Gas (%)	54.3	42.7	7.31	0.368	0	0	0
Sales of space heating units - Electric Heat Pump (%)	6.38	15	36.8	80.8	89	89.6	89.4
Sales of space heating units - Electric Resistance (%)	7.67	12.7	10	4.36	3.39	3.35	3.38
Sales of space heating units - Fossil (%)	12.7	18.7	15.1	7.32	5.58	5.36	5.5
Sales of space heating units - Gas (%)	73.2	53.7	38.1	7.52	2.07	1.74	1.73
Sales of water heating units - Electric Heat Pump (%)	0	0.885	12.1	36.6	40.9	41.1	41.1
Sales of water heating units - Electric Resistance (%)	14.1	27	35.5	53.8	57.2	57.4	57.4
Sales of water heating units - Gas Furnace (%)	84.6	70.7	51	8.14	0.479	0	0
Sales of water heating units - Other (%)	1.29	1.44	1.45	1.46	1.47	1.47	1.48

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	355	907	1,474	2,231	2,430	2,316
Public EV charging plugs - DC Fast (1000 units)	0.064	0	0.767	0	3.41	0	5.52
Public EV charging plugs - L2 (1000 units)	0.076	0	18.5	0	82.2	0	133
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 (%)	1.99	2.19	1.44	0.465	0.082	0.013	0
Vehicle sales - Light-duty - EV (%)	2.46	10.8	39.4	79	96	99.3	100
Vehicle sales - Light-duty - gasoline (%)	92.3	83	56.1	19.4	3.67	0.602	0
Vehicle sales - Light-duty - hybrid (%)	3	3.52	2.71	1.06	0.248	0.051	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.364	0.239	0.076	0.015	0.002	0
Vehicle sales - Light-duty - other (%)	0.121	0.118	0.082	0.029	0.006	0.001	0
Vehicle sales - Medium-duty - diesel (%)	64.7	59.7	42.3	14.4	2.59	0.384	0
Vehicle sales - Medium-duty - EV (%)	0.784	5.07	25.3	60.8	76.5	79.5	80
Vehicle sales - Medium-duty - gasoline (%)	33.7	33.3	25.5	9.32	1.77	0.277	0
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.402	0.341	0.14	0.03	0.005	0
Vehicle sales - Medium-duty - hydrogen FC (%)	0.196	1.27	6.33	15.2	19.1	19.9	20
Vehicle sales - Medium-duty - other (%)	0.253	0.255	0.205	0.083	0.019	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)	0	0	6.09	15.4	28.1	21.2	1.68
Capital invested - Wind - Constrained (billion \$2018)	0	0	14.1	16.9	22.7	17.6	1.66
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Rooftop PV (MW)	238	367	491	639	816	1,022	1,266
Installed (cumulative) - Solar - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Wind - Base land use assumptions (MW)	1,441	1,441	6,018	18,405	42,142	61,045	62,633

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Wind - Base land use assumptions (GWh)	5,019	0	16,177	42,568	81,071	63,846	5,307
Wind - Constrained land use assumptions (GWh)	5,019	0	33,159	45,952	58,547	46,618	4,015

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	51.6	244	351
Conversion capital investment - Cumulative 5-yr (million \$2018)	0	0	0	0	651	2,428	1,352
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	1	7	11
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0.02	0.86	3.99	5.78
Annual - BECCS (MMT)		0	0	0	0.84	3.96	5.7
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0.02	0.03	0.03	0.09
Cumulative - All (MMT)		0	0	0.02	0.88	4.87	10.7
Cumulative - BECCS (MMT)		0	0	0	0.84	4.8	10.5
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0.02	0.05	0.08	0.17

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	803	979	976	1,581	2,108
Cumulative investment - All (million \$2018)		0	1,000	1,096	1,101	1,440	1,718
Cumulative investment - Spur (million \$2018)		0	89.1	185	191	529	807
Cumulative investment - Trunk (million \$2018)		0	911	911	911	911	911
Spur (km)		0	171	348	345	949	1,476
Trunk (km)		0	631	631	631	631	631

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	1.1	3.52	6.32	9.47	13.1
Injection wells (wells)		0	2	8	14	23	28
Resource characterization, appraisal, permitting costs (million \$2020)		70.3	211	281	281	281	281
Wells and facilities construction costs (million \$2020)		0	58.5	228	406	680	844

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-3,913
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-379
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-4,292
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-2,050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-190
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-2,239
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)							6,058
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							586
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,645
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)							3,176
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							293
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,469

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-4,315
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-52,197
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-950
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-7,336
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-123
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-1,890
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,115
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-18,160

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-9,758
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-7,549
Carbon sink potential - Low - Accelerate regeneration (1000 tCO ₂ e/y)							-2,162
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-18,935
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-2,818
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							-62.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-630
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-740
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							-9,080
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-739
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-2,545
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-3,239
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-35,565
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-554
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-5,077
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-92
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-1,260
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-1,427
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-13,620
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-5,249
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-5,047
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							706
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							129
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,741
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							45.4
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							277
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,502
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,802
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							353
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							121
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,433
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							22.7
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)							106
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							600
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							48.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,514
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,198
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							529
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							125
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,587
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							34.2
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)							153
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							900

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,049
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,726

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

Item	2020	2025	2030	2035	2040	2045	2050
Natural gas consumption - Annual (tcf)		67.4	56.8	45.5	34.3	21.6	15
Natural gas consumption - Cumulative (tcf)		0	0	0	0	0	1,372
Natural gas production - Annual (tcf)		51.4	48.6	42.3	35.8	28.4	22
Oil consumption - Annual (million bbls)		38.1	33.4	26.3	19.3	13.8	9.02
Oil consumption - Cumulative (million bbls)		0	0	0	0	0	802
Oil production - Annual (million bbls)		27.9	28	28	22.2	18	12

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		29.1	0.026	0.026	0.021	0.013	0
Monetary damages from air pollution - Natural Gas (million 2019\$)		8.17	4.5	3.32	2.98	1.97	0.803
Monetary damages from air pollution - Transportation (million 2019\$)		31.4	28.6	21.2	11.8	5.17	1.86
Premature deaths from air pollution - Coal (deaths)		3.29	0.003	0.003	0.002	0.001	0
Premature deaths from air pollution - Natural Gas (deaths)		0.922	0.508	0.374	0.336	0.223	0.091
Premature deaths from air pollution - Transportation (deaths)		3.53	3.22	2.38	1.33	0.581	0.21

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		0.872	1.77	0.676	61.5	237	282
By economic sector - Construction (jobs)		2,303	4,690	9,475	18,099	20,940	17,188
By economic sector - Manufacturing (jobs)		1,801	2,738	3,857	4,732	4,623	4,155
By economic sector - Mining (jobs)		1,560	977	757	523	420	316
By economic sector - Other (jobs)		208	389	890	1,774	2,245	2,228
By economic sector - Pipeline (jobs)		183	299	187	155	166	159
By economic sector - Professional (jobs)		1,256	2,527	6,074	12,320	15,731	14,431
By economic sector - Trade (jobs)		1,474	1,737	3,436	6,579	8,409	7,904
By economic sector - Utilities (jobs)		1,593	3,822	8,066	16,794	18,507	13,362
By education level - All sectors - Associates degree or some college (jobs)		3,131	5,444	10,497	19,726	22,975	19,268
By education level - All sectors - Bachelors degree (jobs)		2,232	3,578	6,825	12,704	15,069	12,960
By education level - All sectors - Doctoral degree (jobs)		73.7	128	272	527	658	595
By education level - All sectors - High school diploma or less (jobs)		4,426	7,162	13,403	24,741	28,549	23,705
By education level - All sectors - Masters or professional degree (jobs)		516	870	1,745	3,339	4,025	3,497

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Biomass (jobs)		3.74	4.88	1.93	185	864	1,204
By resource sector - CO2 (jobs)		37.3	1,182	508	539	966	1,161
By resource sector - Coal (jobs)		1,275	289	38.3	28.4	22.1	18.5
By resource sector - Grid (jobs)		2,065	5,617	14,735	31,818	34,432	23,747
By resource sector - Natural Gas (jobs)		1,057	866	678	516	356	304
By resource sector - Nuclear (jobs)		0	0.003	0.007	0	0	0
By resource sector - Oil (jobs)		2,936	2,511	2,051	1,458	1,047	650
By resource sector - Solar (jobs)		1,501	1,612	2,268	2,400	2,542	3,997
By resource sector - Wind (jobs)		1,504	5,100	12,462	24,093	31,048	28,942
Median wages - Annual - All (\$2019 per job)		58,901	59,961	61,023	62,415	63,410	64,072
On-Site or In-Plant Training - Total jobs - 1 to 4 years (jobs)		1,641	2,823	5,410	10,152	11,785	9,819
On-Site or In-Plant Training - Total jobs - 4 to 10 years (jobs)		650	1,192	2,346	4,507	5,268	4,377
On-Site or In-Plant Training - Total jobs - None (jobs)		1,662	2,785	5,331	9,916	11,671	9,961
On-Site or In-Plant Training - Total jobs - Over 10 years (jobs)		79.9	150	295	563	655	544
On-Site or In-Plant Training - Total jobs - Up to 1 year (jobs)		6,346	10,231	19,360	35,900	41,898	35,324
On-the-Job Training - All sectors - 1 to 4 years (jobs)		2,085	3,647	7,027	13,234	15,381	12,818
On-the-Job Training - All sectors - 4 to 10 years (jobs)		619	1,166	2,324	4,496	5,254	4,356
On-the-Job Training - All sectors - None (jobs)		579	926	1,756	3,251	3,831	3,282
On-the-Job Training - All sectors - Over 10 years (jobs)		99.5	169	309	553	640	544
On-the-Job Training - All sectors - Up to 1 year (jobs)		6,996	11,273	21,326	39,504	46,171	39,023
Related work experience - All sectors - 1 to 4 years (jobs)		3,793	6,201	11,815	22,058	25,790	21,730
Related work experience - All sectors - 4 to 10 years (jobs)		2,388	4,053	7,777	14,575	17,054	14,369
Related work experience - All sectors - None (jobs)		1,466	2,463	4,677	8,745	10,185	8,533
Related work experience - All sectors - Over 10 years (jobs)		642	1,074	2,030	3,749	4,361	3,671
Related work experience - All sectors - Up to 1 year (jobs)		2,090	3,391	6,444	11,911	13,886	11,720
Wage income - All (million \$2019)		611	1,030	1,998	3,810	4,520	3,846

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	2,913	3,236	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 (%)	1.5	6.8	8.07	12.3	22.6	35.6	43.2
Sales of space heating units - Electric Resistance (%)	1.52	3.34	3.42	3.7	4.38	5.25	5.76
Sales of space heating units - Fossil (%)	0.745	0.256	0.248	0.218	0.176	0.148	0.138
Sales of space heating units - Gas Furnace (%)	96.2	89.6	88.3	83.8	72.8	59	50.9
Sales of water heating units - Electric Heat Pump (%)	0.014	0.311	1.08	3.65	9.87	17.8	22.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Resistance (%)	0.703	1.74	2.51	5.07	11.2	19.1	23.7
Sales of water heating units - Gas Furnace (%)	99.1	97.6	96	90.9	78.5	62.8	53.5
Sales of water heating units - Other (%)	0.168	0.382	0.381	0.382	0.381	0.382	0.382

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)		0.533	0.545	0.763	0.799	1.2	1.28

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.7	39.8	39.5	39.3	39	38.5	38.2
Final energy use - Industry (PJ)	59.8	62	62.6	64.9	69.5	70.8	71.6
Final energy use - Residential (PJ)	52.9	50.4	48.8	47.5	46.1	44.2	41.9
Final energy use - Transportation (PJ)	114	108	97.9	90.4	84.6	78	70.1

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	0.764	0.811	0	0	0	0
Sales of cooking units - Electric Resistance (%)	45.5	46.9	51.9	65.1	83.3	94.6	98.6
Sales of cooking units - Gas (%)	54.5	53.1	48.1	34.9	16.7	5.38	1.45
Sales of space heating units - Electric Heat Pump (%)	6.38	13.4	14.6	18.9	28.9	41.1	47.9
Sales of space heating units - Electric Resistance (%)	7.67	12.8	12.6	12.2	11.2	9.66	8.73
Sales of space heating units - Fossil (%)	12.7	18.9	19	17.6	14.9	12.7	12
Sales of space heating units - Gas (%)	73.2	54.8	53.7	51.3	45	36.6	31.3
Sales of water heating units - Electric Heat Pump (%)	0	0.236	0.883	3.03	8.23	14.8	18.7
Sales of water heating units - Electric Resistance (%)	14.1	26.5	27.1	28.9	33	37.9	40.9
Sales of water heating units - Gas Furnace (%)	84.6	71.8	70.5	66.6	57.3	45.8	39
Sales of water heating units - Other (%)	1.29	1.45	1.46	1.47	1.48	1.48	1.48

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	56.9	121	407	1,283	1,868
Public EV charging plugs - DC Fast (1000 units)	0.064	0	0.231	0	1.26	0	3.54
Public EV charging plugs - L2 (1000 units)	0.076	0	5.57	0	30.4	0	85.3
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.332	0.969	2.74	7.17	15.7	26.3	34
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.99	2.33	2.14	1.73	1.14	0.597	0.254
Vehicle sales - Light-duty - EV (%)	1.38	3.57	9.48	22	44.1	69.2	86.4
Vehicle sales - Light-duty - gasoline (%)	93.3	89.6	83.4	71.5	51	27.9	12.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hybrid (%)	3.08	3.99	4.56	4.36	3.48	2.18	1.1
Vehicle sales - Light-duty - hydrogen FC (%)	0.114	0.393	0.352	0.279	0.205	0.117	0.054
Vehicle sales - Light-duty - other (%)	0.122	0.125	0.117	0.104	0.077	0.043	0.02
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)							-3,913
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-379
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,292
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-190
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,239
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)							6,058
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							586
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,645
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)							3,176
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							293
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,469

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)							-4,315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-52,197
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-950
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,336
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-123
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,890
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,115
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-18,160
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,758
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,549
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-2,162
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-18,935
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,818
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-62.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-630
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-740
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-9,080
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-739
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,545
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,239
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-35,565
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-554
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,077
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-92
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,260
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,427
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-13,620
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,249
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,047

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							706
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							129
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,741
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							45.4
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)							201
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							277
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,502
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,802
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							353
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							121
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,433
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							22.7
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)							106
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							600
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							48.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,514
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,198
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							529

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							125
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,587
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							34.2
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)							153
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							900
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,049
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,726

Table 24: E- scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		29.1	0.026	0.026	0.021	0.013	0
Monetary damages from air pollution - Natural Gas (million 2019\$)		8.47	4.06	2.54	1.59	0.897	0.529
Monetary damages from air pollution - Transportation (million 2019\$)		31.8	31.3	29.7	26.1	20.2	13.5
Premature deaths from air pollution - Coal (deaths)		3.29	0.003	0.003	0.002	0.001	0
Premature deaths from air pollution - Natural Gas (deaths)		0.956	0.458	0.286	0.18	0.101	0.06
Premature deaths from air pollution - Transportation (deaths)		3.58	3.52	3.34	2.93	2.27	1.51

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	2,913	3,241	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 (%)	1.5	8.17	31.2	81.3	90.2	90.8	90.8
Sales of space heating units - Electric Resistance (%)	1.52	3.43	4.91	8.08	8.65	8.7	8.7
Sales of space heating units - Fossil (%)	0.745	0.218	0.042	0.002	0	0	0
Sales of space heating units - Gas Furnace (%)	96.2	88.2	63.9	10.6	1.1	0.5	0.497
Sales of water heating units - Electric Heat Pump (%)	0.014	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	0.703	2.51	15.8	44.8	50.1	50.4	50.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	99.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.168	0.382	0.381	0.382	0.381	0.382	0.382

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)		0.684	0.713	1.5	1.62	1.36	1.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.7	39.7	38.9	36.8	34.2	32.3	31.5
Final energy use - Industry (PJ)	59.8	61.8	62	63.1	66.8	68.2	69.6
Final energy use - Residential (PJ)	52.9	50.4	48	42.8	36.5	31.6	28.2
Final energy use - Transportation (PJ)	114	107	94.2	79	65.2	56.7	53

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	0.766	0.814	0	0	0	0
Sales of cooking units - Electric Resistance (%)	45.7	57.3	92.7	99.6	100	100	100
Sales of cooking units - Gas (%)	54.3	42.7	7.31	0.368	0	0	0
Sales of space heating units - Electric Heat Pump (%)	6.38	15	36.8	80.8	89	89.6	89.4
Sales of space heating units - Electric Resistance (%)	7.67	12.7	10	4.36	3.39	3.35	3.38
Sales of space heating units - Fossil (%)	12.7	18.7	15.1	7.32	5.58	5.36	5.5
Sales of space heating units - Gas (%)	73.2	53.7	38.1	7.52	2.07	1.74	1.73
Sales of water heating units - Electric Heat Pump (%)	0	0.885	12.1	36.6	40.9	41.1	41.1
Sales of water heating units - Electric Resistance (%)	14.1	27	35.5	53.8	57.2	57.4	57.4
Sales of water heating units - Gas Furnace (%)	84.6	70.7	51	8.14	0.479	0	0
Sales of water heating units - Other (%)	1.29	1.44	1.45	1.46	1.47	1.47	1.48

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	355	907	1,474	2,231	2,430	2,316
Public EV charging plugs - DC Fast (1000 units)	0.064	0	0.767	0	3.41	0	5.52
Public EV charging plugs - L2 (1000 units)	0.076	0	18.5	0	82.2	0	133
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 (%)	1.99	2.19	1.44	0.465	0.082	0.013	0
Vehicle sales - Light-duty - EV (%)	2.46	10.8	39.4	79	96	99.3	100
Vehicle sales - Light-duty - gasoline (%)	92.3	83	56.1	19.4	3.67	0.602	0
Vehicle sales - Light-duty - hybrid (%)	3	3.52	2.71	1.06	0.248	0.051	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.364	0.239	0.076	0.015	0.002	0
Vehicle sales - Light-duty - other (%)	0.121	0.118	0.082	0.029	0.006	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 - Wind - Base (billion \$2018)	0	0	6.97	38.5	52.8	46	55.7
Installed (cumulative) - OffshoreWind - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Solar - Base land use assumptions (MW)	0	0	0	0	0	0	0
Installed (cumulative) - Wind - Base land use assumptions (MW)	1,441	1,441	6,674	37,727	82,379	123,393	176,023

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

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Base land use assumptions (GWh)	5,019		18,423	106,433	149,752	133,206	162,262
Wind - Constrained land use assumptions (GWh)	5,019		36,764	91,058	117,649	71,623	155,570

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)							-3,913
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-379
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,292
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-190
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,239
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)							6,058

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							586
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,645
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)							3,176
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							293
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,469

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 tCO ₂ e/y)							-4,315
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-52,197
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-950
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-7,336
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-123
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-1,890
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,115
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-18,160
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-9,758
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-7,549
Carbon sink potential - Low - Accelerate regeneration (1000 tCO ₂ e/y)							-2,162
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-18,935
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-2,818
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							-62.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-630
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-740
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							-9,080
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-739
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-2,545

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,239
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-35,565
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-554
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,077
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-92
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,260
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,427
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-13,620
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,249
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,047
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							706
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							129
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,741
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							45.4
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)							201
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							277
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,502
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,802
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							353
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							121
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,433
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							22.7

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							106
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							600
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							48.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,514
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,198
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							529
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							125
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,587
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							34.2
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)							153
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							900
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,049
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,726

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		29.1	0.026	0.026	0.021	0.013	0
Monetary damages from air pollution - Natural Gas (million 2019\$)		7.46	3.7	1.91	1.51	0.909	0.379
Monetary damages from air pollution - Transportation (million 2019\$)		31.4	28.6	21.2	11.8	5.17	1.86
Premature deaths from air pollution - Coal (deaths)		3.29	0.003	0.003	0.002	0.001	0
Premature deaths from air pollution - Natural Gas (deaths)		0.842	0.418	0.216	0.17	0.103	0.043
Premature deaths from air pollution - Transportation (deaths)		3.53	3.22	2.38	1.33	0.581	0.21

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	2,913	3,241	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 (%)	1.5	8.17	31.2	81.3	90.2	90.8	90.8
Sales of space heating units - Electric Resistance (%)	1.52	3.43	4.91	8.08	8.65	8.7	8.7
Sales of space heating units - Fossil (%)	0.745	0.218	0.042	0.002	0	0	0
Sales of space heating units - Gas Furnace (%)	96.2	88.2	63.9	10.6	1.1	0.5	0.497
Sales of water heating units - Electric Heat Pump (%)	0.014	1.08	14.4	43.7	48.9	49.2	49.2
Sales of water heating units - Electric Resistance (%)	0.703	2.51	15.8	44.8	50.1	50.4	50.4
Sales of water heating units - Gas Furnace (%)	99.1	96	69.4	11.1	0.657	0	0
Sales of water heating units - Other (%)	0.168	0.382	0.381	0.382	0.381	0.382	0.382

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)		0.684	0.713	1.5	1.62	1.36	1.44

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.7	39.7	38.9	36.8	34.2	32.3	31.5
Final energy use - Industry (PJ)	59.8	61.8	62	63.1	66.8	68.2	69.6
Final energy use - Residential (PJ)	52.9	50.4	48	42.8	36.5	31.6	28.2
Final energy use - Transportation (PJ)	114	107	94.2	79	65.2	56.7	53

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	0.766	0.814	0	0	0	0
Sales of cooking units - Electric Resistance (%)	45.7	57.3	92.7	99.6	100	100	100
Sales of cooking units - Gas (%)	54.3	42.7	7.31	0.368	0	0	0
Sales of space heating units - Electric Heat Pump (%)	6.38	15	36.8	80.8	89	89.6	89.4
Sales of space heating units - Electric Resistance (%)	7.67	12.7	10	4.36	3.39	3.35	3.38
Sales of space heating units - Fossil (%)	12.7	18.7	15.1	7.32	5.58	5.36	5.5
Sales of space heating units - Gas (%)	73.2	53.7	38.1	7.52	2.07	1.74	1.73
Sales of water heating units - Electric Heat Pump (%)	0	0.885	12.1	36.6	40.9	41.1	41.1
Sales of water heating units - Electric Resistance (%)	14.1	27	35.5	53.8	57.2	57.4	57.4
Sales of water heating units - Gas Furnace (%)	84.6	70.7	51	8.14	0.479	0	0
Sales of water heating units - Other (%)	1.29	1.44	1.45	1.46	1.47	1.47	1.48

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	355	907	1,474	2,231	2,430	2,316
Public EV charging plugs - DC Fast (1000 units)	0.064	0	0.767	0	3.41	0	5.52
Public EV charging plugs - L2 (1000 units)	0.076	0	18.5	0	82.2	0	133
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 (%)	1.99	2.19	1.44	0.465	0.082	0.013	0
Vehicle sales - Light-duty - EV (%)	2.46	10.8	39.4	79	96	99.3	100
Vehicle sales - Light-duty - gasoline (%)	92.3	83	56.1	19.4	3.67	0.602	0
Vehicle sales - Light-duty - hybrid (%)	3	3.52	2.71	1.06	0.248	0.051	0
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.364	0.239	0.076	0.015	0.002	0
Vehicle sales - Light-duty - other (%)	0.121	0.118	0.082	0.029	0.006	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 - Wind - Base (billion \$2018)		0	3.32	2.67	16	13.4	0
Capital invested - Wind - Constrained (billion \$2018)		0	4.62	8.11	17.2	11.2	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Base land use assumptions (GWh)	5,019		8,928	7,497	46,532	41,025	
Wind - Constrained land use assumptions (GWh)	5,019		11,765	22,225	48,474	30,917	

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)							-3,913
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-379
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,292
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-2,050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-190
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-2,239
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)							6,058
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							586
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							6,645
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)							3,176
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							293
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,469

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 tCO ₂ e/y)							-4,315
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-52,197
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-950
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-7,336
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-123
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-1,890
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,115
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-18,160
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-9,758
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-7,549
Carbon sink potential - Low - Accelerate regeneration (1000 tCO ₂ e/y)							-2,162
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-18,935
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-158

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-2,818
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							-62.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-630
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-740
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							-9,080
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-739
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-2,545
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-3,239
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-35,565
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-554
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-5,077
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-92
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-1,260
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-1,427
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-13,620
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-5,249
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-5,047
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							706
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							129
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,741
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							45.4
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)							201
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							277
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,502

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 - Total impacted (over 30 years) (1000 hectares)							8,802
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							353
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							121
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,433
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							22.7
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)							106
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							600
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							48.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,514
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,198
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							529
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							125
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,587
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							34.2
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)							153
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							900
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,049
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,726

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		29.1	0.026	0.026	0.021	0.013	0
Monetary damages from air pollution - Natural Gas (million 2019\$)		8.17	4.5	4.38	4.98	2.56	0.684
Monetary damages from air pollution - Transportation (million 2019\$)		31.4	28.6	21.2	11.8	5.17	1.86
Premature deaths from air pollution - Coal (deaths)		3.29	0.003	0.003	0.002	0.001	0
Premature deaths from air pollution - Natural Gas (deaths)		0.922	0.508	0.494	0.562	0.289	0.077
Premature deaths from air pollution - Transportation (deaths)		3.53	3.22	2.38	1.33	0.581	0.21

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	2,913	3,236	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 (%)	1.5	6.8	8.07	12.3	22.6	35.6	43.2
Sales of space heating units - Electric Resistance (%)	1.52	3.34	3.42	3.7	4.38	5.25	5.76
Sales of space heating units - Fossil (%)	0.745	0.256	0.248	0.218	0.176	0.148	0.138
Sales of space heating units - Gas Furnace (%)	96.2	89.6	88.3	83.8	72.8	59	50.9
Sales of water heating units - Electric Heat Pump (%)	0.014	0.311	1.08	3.65	9.87	17.8	22.4
Sales of water heating units - Electric Resistance (%)	0.703	1.74	2.51	5.07	11.2	19.1	23.7
Sales of water heating units - Gas Furnace (%)	99.1	97.6	96	90.9	78.5	62.8	53.5
Sales of water heating units - Other (%)	0.168	0.382	0.381	0.382	0.381	0.382	0.382

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)		0.533	0.545	0.763	0.799	1.2	1.28

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.7	39.8	39.5	39.3	39	38.5	38.2
Final energy use - Industry (PJ)	59.8	62	62.6	64.9	69.5	70.8	71.6
Final energy use - Residential (PJ)	52.9	50.4	48.8	47.5	46.1	44.2	41.9
Final energy use - Transportation (PJ)	114	108	97.9	90.4	84.6	78	70.1

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	0.764	0.811	0	0	0	0
Sales of cooking units - Electric Resistance (%)	45.5	46.9	51.9	65.1	83.3	94.6	98.6
Sales of cooking units - Gas (%)	54.5	53.1	48.1	34.9	16.7	5.38	1.45
Sales of space heating units - Electric Heat Pump (%)	6.38	13.4	14.6	18.9	28.9	41.1	47.9

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 (%)	7.67	12.8	12.6	12.2	11.2	9.66	8.73
Sales of space heating units - Fossil (%)	12.7	18.9	19	17.6	14.9	12.7	12
Sales of space heating units - Gas (%)	73.2	54.8	53.7	51.3	45	36.6	31.3
Sales of water heating units - Electric Heat Pump (%)	0	0.236	0.883	3.03	8.23	14.8	18.7
Sales of water heating units - Electric Resistance (%)	14.1	26.5	27.1	28.9	33	37.9	40.9
Sales of water heating units - Gas Furnace (%)	84.6	71.8	70.5	66.6	57.3	45.8	39
Sales of water heating units - Other (%)	1.29	1.45	1.46	1.47	1.48	1.48	1.48

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	56.9	121	407	1,283	1,868
Public EV charging plugs - DC Fast (1000 units)	0.064	0	0.231	0	1.26	0	3.54
Public EV charging plugs - L2 (1000 units)	0.076	0	5.57	0	30.4	0	85.3
Vehicle sales - Heavy-duty - diesel (%)	97.4	96	91.3	79.8	58.2	32.1	13.7
Vehicle sales - Heavy-duty - EV (%)	0.498	1.45	4.11	10.8	23.6	39.5	51
Vehicle sales - Heavy-duty - gasoline (%)	0.228	0.236	0.239	0.225	0.179	0.109	0.051
Vehicle sales - Heavy-duty - hybrid (%)	0.083	0.094	0.104	0.107	0.092	0.06	0.03
Vehicle sales - Heavy-duty - hydrogen FC (%)	0.332	0.969	2.74	7.17	15.7	26.3	34
Vehicle sales - Heavy-duty - other (%)	1.5	1.28	1.46	1.95	2.25	1.96	1.14
Vehicle sales - Light-duty - diesel (%)	1.99	2.33	2.14	1.73	1.14	0.597	0.254
Vehicle sales - Light-duty - EV (%)	1.38	3.57	9.48	22	44.1	69.2	86.4
Vehicle sales - Light-duty - gasoline (%)	93.3	89.6	83.4	71.5	51	27.9	12.2
Vehicle sales - Light-duty - hybrid (%)	3.08	3.99	4.56	4.36	3.48	2.18	1.1
Vehicle sales - Light-duty - hydrogen FC (%)	0.114	0.393	0.352	0.279	0.205	0.117	0.054
Vehicle sales - Light-duty - other (%)	0.122	0.125	0.117	0.104	0.077	0.043	0.02
Vehicle sales - Medium-duty - diesel (%)	64.8	62.2	57.7	49.4	35.6	19.6	8.37
Vehicle sales - Medium-duty - EV (%)	0.664	1.94	5.49	14.3	31.4	52.6	68
Vehicle sales - Medium-duty - gasoline (%)	33.8	34.7	34.7	31.9	24.4	14.2	6.33
Vehicle sales - Medium-duty - hybrid (%)	0.363	0.418	0.464	0.478	0.414	0.275	0.141
Vehicle sales - Medium-duty - hydrogen FC (%)	0.166	0.485	1.37	3.58	7.86	13.2	17
Vehicle sales - Medium-duty - other (%)	0.253	0.266	0.279	0.286	0.258	0.184	0.102

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0.007	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0.029	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	7.37	7.39
Biomass w/ccu power plant (GWh)	0	0	0	0	0	32.3	32.3

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	276	394	484
Conversion capital investment - Cumulative 5-yr (million \$2018)	0	0	0	0	3,205	1,391	1,046
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	4	6	8
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	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0.02	4.15	5.92	7.33
Annual - BECCS (MMT)		0	0	0	4.12	5.89	7.23
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Annual - NGCC (MMT)		0	0	0.02	0.03	0.03	0.09
Cumulative - All (MMT)		0	0	0.02	4.17	10.1	17.4
Cumulative - BECCS (MMT)		0	0	0	4.12	10	17.2
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - NGCC (MMT)		0	0	0.02	0.05	0.08	0.17

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	803	979	1,119	1,413	2,232
Cumulative investment - All (million \$2018)		0	1,000	1,101	1,204	1,382	1,840
Cumulative investment - Spur (million \$2018)		0	89.2	191	294	471	929
Cumulative investment - Trunk (million \$2018)		0	911	911	911	911	911
Spur (km)		0	171	348	487	781	1,601
Trunk (km)		0	631	631	631	631	631

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

Item	2020	2025	2030	2035	2040	2045	2050
CO2 storage (MMT)		0	2.77	10.7	21.4	28.6	30.9
Injection wells (wells)		0	5	20	35	59	73
Resource characterization, appraisal, permitting costs (million \$2020)		70.3	323	506	506	506	506
Wells and facilities construction costs (million \$2020)		0	152	593	1,057	1,767	2,194

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)							-41.1

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)							-3,856
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)							-373
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,270
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-41.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,020
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)							-186
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,247
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							71.9
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							14,741
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							26.2
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							576
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							15,427
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							71.9
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,129
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							26.2
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							11.7

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)							288
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,527

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)							-4,315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-52,197
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-950
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,336
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-123
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,890
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,115
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-18,160
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,758
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,549
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-2,162
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-18,935
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,818
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-62.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-630
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-740
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-9,080
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-739
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,545
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,239
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-35,565
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-554
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-5,077
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-92
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,260

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 tCO ₂ e/y)							-1,427
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-13,620
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-5,249
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-5,047
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							706
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							129
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,741
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							45.4
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)							201
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							277
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,502
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,802
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							353
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							121
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,433
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							22.7
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)							106
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							600
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							48.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,514

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)							4,198
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							529
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							125
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,587
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							34.2
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)							153
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							900
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,049
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,726

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		29.1	0.026	0.026	0.021	0.013	0
Monetary damages from air pollution - Natural Gas (million 2019\$)		8.01	3.87	2.72	2.19	1.38	0.578
Monetary damages from air pollution - Transportation (million 2019\$)		31.8	31.3	29.7	26.1	20.2	13.5
Premature deaths from air pollution - Coal (deaths)		3.29	0.003	0.003	0.002	0.001	0
Premature deaths from air pollution - Natural Gas (deaths)		0.904	0.437	0.307	0.247	0.156	0.065
Premature deaths from air pollution - Transportation (deaths)		3.58	3.52	3.34	2.93	2.27	1.51

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	2,877	3,019	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 (%)	1.5	13.9	46.9	73.9	78.3	78.8	78.8
Sales of space heating units - Electric Resistance (%)	1.52	4.25	8.7	15.6	19.9	20.6	20.7
Sales of space heating units - Fossil (%)	0.745	0.237	0.139	0.039	0.005	0	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 (%)	96.2	81.6	44.3	10.4	1.72	0.56	0.498
Sales of water heating units - Electric Heat Pump (%)	0.014	0.03	0.03	0.03	0.03	0.03	0.03
Sales of water heating units - Electric Resistance (%)	0.703	1.46	1.46	1.47	1.46	1.47	1.46
Sales of water heating units - Gas Furnace (%)	99.1	98.1	98.1	98.1	98.1	98.1	98.1
Sales of water heating units - Other (%)	0.168	0.382	0.381	0.382	0.381	0.382	0.382

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)		0.658	0.684	0.911	0.962	0.877	0.911

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Commercial (PJ)	39.7	40.5	41.2	41.2	41.3	42.1	44
Final energy use - Industry (PJ)	59.8	64.3	67.6	71.3	75.8	81.9	87.9
Final energy use - Residential (PJ)	52.9	50.7	49.9	49.5	49.7	50.2	50.6
Final energy use - Transportation (PJ)	114	108	98.9	93.7	93.4	95.8	99

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	0.752	0.765	0	0	0	0
Sales of cooking units - Electric Resistance (%)	45	45	45	45	45	45	45
Sales of cooking units - Gas (%)	55	55	55	55	55	55	55
Sales of space heating units - Electric Heat Pump (%)	5.75	17	17.3	17.9	18.4	19	19.4
Sales of space heating units - Electric Resistance (%)	7.76	12.4	12.2	12.2	12.1	11.8	11.2
Sales of space heating units - Fossil (%)	12.8	17.8	18.1	17.5	16.3	15.8	16.4
Sales of space heating units - Gas (%)	73.7	52.8	52.4	52.5	53.2	53.4	53
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	14.1	26.3	26.5	26.7	26.9	27	27.1
Sales of water heating units - Gas Furnace (%)	84.6	72.2	72.1	71.9	71.6	71.5	71.4
Sales of water heating units - Other (%)	1.29	1.45	1.46	1.47	1.48	1.49	1.49

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 (%)	1.99	2.33	2.26	2.1	1.91	1.79	1.7
Vehicle sales - Light-duty - EV (%)	2.12	3.76	4.3	5.17	6.37	7.62	8.71
Vehicle sales - Light-duty - gasoline (%)	92.6	89.4	88.1	86.8	85.2	83.3	81.5
Vehicle sales - Light-duty - hybrid (%)	3.02	3.95	4.84	5.43	6.09	6.85	7.62

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle sales - Light-duty - hydrogen FC (%)	0.113	0.392	0.372	0.337	0.339	0.344	0.356
Vehicle sales - Light-duty - other (%)	0.122	0.125	0.123	0.125	0.125	0.125	0.129
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)							-4,315
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-52,197
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-950
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-7,336
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-123
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,890
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,115
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-18,160
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,758
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,549
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-2,162
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-18,935
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-158
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,818
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-62.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-630
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-740
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-9,080
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-739
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,545
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-3,239
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-35,565
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-554

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)							-5,077
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-92
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,260
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,427
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-13,620
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,249
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,047
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							706
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							129
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							3,741
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							45.4
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)							201
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							277
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,502
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,802
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							353
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							121
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,433
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							22.7
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)							106

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)							600
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							48.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,514
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,198
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							529
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							125
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,587
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							34.2
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)							153
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							900
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							347
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,049
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,726

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

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-13.8		5.12				1.47
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.514		-1.07				-1.12
Business-as-usual carbon sink - Total (Mt CO2e/y)	-14.3		4.05				0.342

Table 66: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Coal (million 2019\$)		60	33.6	16.5	12.8	11.3	10.6
Monetary damages from air pollution - Natural Gas (million 2019\$)		9.16	8.17	8.03	6	5.54	3.98
Monetary damages from air pollution - Transportation (million 2019\$)		31.9	31.7	31.6	31.7	31.7	31.7
Premature deaths from air pollution - Coal (deaths)		6.77	3.79	1.87	1.44	1.28	1.2
Premature deaths from air pollution - Natural Gas (deaths)		1.03	0.922	0.906	0.677	0.625	0.45

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Transportation (deaths)		3.58	3.57	3.56	3.56	3.56	3.56