



Net-Zero America - Rhode Island data

October 29, 2021 (updated November 17, 2023)

See the [Data Sheet Guide](#) for explanations of the contents of this document. The data herein underlie graphs and tables found in Princeton's Net-Zero America report:

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Table 1: *E+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		11.1	0.012	0.012	0.011	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.43	3.18	2.2	2.68	1.66	0.983
Premature deaths from air pollution - Mobile - On-Road (deaths)		37.1	34.4	26	14.9	6.64	2.42
Premature deaths from air pollution - Gas Stations (deaths)		1.7	1.54	1.14	0.659	0.301	0.122
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.64	6.58	4.66	2.66	1.29	0.502
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		14.5	11.4	7.59	4.28	1.81	0.546
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.1	0.999	0.781	0.52	0.293	0.15
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.235	0.224	0.212	0.2	0.188	0.175
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		6.77	6	4.77	3.36	2.14	1.15
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		4.6	3.8	2.68	1.66	1.13	0.827
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.649	0.543	0.44	0.341	0.248	0.161
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.093	0.048	0.048	0.047	0.047	0.046
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		6.32	5.75	4.99	3.86	2.73	1.62
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		98.3	0.103	0.103	0.098	0.06	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		57	28.2	19.5	23.7	14.7	8.71
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		330	306	231	132	59.1	21.5
Monetary damages from air pollution - Gas Stations (million \$2019)		15	13.6	10.1	5.84	2.66	1.08
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		67.7	58.3	41.3	23.6	11.4	4.45
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		128	101	67.3	37.9	16.1	4.84
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		9.75	8.86	6.92	4.61	2.6	1.33
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.08	1.98	1.88	1.77	1.66	1.55
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		59.9	53.1	42.2	29.8	19	10.2

Table 1: *E+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		40.8	33.7	23.7	14.7	10	7.32
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.75	4.81	3.9	3.02	2.19	1.42
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.82	0.426	0.421	0.413	0.416	0.41
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		56.1	51.1	44.3	34.3	24.2	14.4

Table 2: *E+ scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		14.1	28.6	10.9	8.49	6.24	81.2
By economic sector - Construction (jobs)		1,137	1,293	1,151	1,546	1,440	1,891
By economic sector - Manufacturing (jobs)		470	552	626	645	680	926
By economic sector - Mining (jobs)		428	300	186	105	51.4	21.4
By economic sector - Other (jobs)		131	179	131	175	179	308
By economic sector - Pipeline (jobs)		101	85	65.4	46.5	28.2	27.1
By economic sector - Professional (jobs)		472	528	486	700	662	995
By economic sector - Trade (jobs)		437	435	360	446	415	595
By economic sector - Utilities (jobs)		799	774	1,073	1,922	1,731	1,974
By resource sector - Biomass (jobs)		60.5	79	31.2	25.6	22.8	347
By resource sector - CO2 (jobs)		0	0	0	0	0	84.7
By resource sector - Grid (jobs)		559	1,019	1,767	2,917	2,913	3,412
By resource sector - Natural Gas (jobs)		1,212	685	545	1,083	684	570
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,004	772	517	310	166	63.6
By resource sector - Solar (jobs)		1,044	1,342	739	790	893	1,587
By resource sector - Wind (jobs)		110	278	490	467	514	755
By education level - All sectors - High school diploma or less (jobs)		1,684	1,795	1,748	2,359	2,198	2,902
By education level - All sectors - Associates degree or some college (jobs)		1,246	1,309	1,308	1,834	1,703	2,208
By education level - All sectors - Bachelors degree (jobs)		834	841	813	1,095	1,010	1,330
By education level - All sectors - Masters or professional degree (jobs)		198	201	195	269	249	332
By education level - All sectors - Doctoral degree (jobs)		28.4	29.4	26.2	35.1	32.4	46.5
Related work experience - All sectors - None (jobs)		580	607	597	824	763	1,003
Related work experience - All sectors - Up to 1 year (jobs)		783	844	813	1,087	1,021	1,377
Related work experience - All sectors - 1 to 4 years (jobs)		1,445	1,501	1,472	2,016	1,867	2,441
Related work experience - All sectors - 4 to 10 years (jobs)		937	969	956	1,323	1,222	1,585
Related work experience - All sectors - Over 10 years (jobs)		245	254	253	344	320	414
On-the-Job Training - All sectors - None (jobs)		221	231	217	288	268	360
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,612	2,735	2,673	3,613	3,363	4,453
On-the-Job Training - All sectors - 1 to 4 years (jobs)		844	881	877	1,231	1,138	1,462

Table 2: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 4 to 10 years (jobs)		274	287	283	411	376	480
On-the-Job Training - All sectors - Over 10 years (jobs)		39.7	41.9	39.3	50.9	47.5	62.8
On-Site or In-Plant Training - All sectors - None (jobs)		646	677	652	884	822	1,095
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,374	2,485	2,434	3,297	3,068	4,049
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		654	685	680	948	878	1,132
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		282	292	287	412	377	481
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		33.9	35.7	36.5	52.6	48.6	62.3
Wage income - All (million \$2019)		245	256	256	360	336	442

Table 3: *E+ scenario - IMPACTS - Fossil fuel industries*

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		22.6	18.9	13.7	8.88	5.07	2.07
Oil consumption - Cumulative (million bbls)							426
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		78.8	66.4	53.3	40.1	25.2	17.5
Natural gas consumption - Cumulative (tcf)							1,604
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	58.1	53.8	47.4	39.2	31.8	27.1	24.9
Final energy use - Residential (PJ)	45.6	42.8	39.4	34.2	28.6	24.4	21.9
Final energy use - Commercial (PJ)	37.9	36	34.2	31.9	29.5	27.8	26.7
Final energy use - Industry (PJ)	7.41	7.1	7.08	7.12	7.25	7.42	7.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		0.337	0.347	1.19	1.3	1.08	1.15

Table 6: *E+ scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	5.42	76.6	148	397	646	845	1,044
Vehicle stocks - LDV – All others (1000 units)	871	829	788	574	360	204	47.4
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		167	429	695	1,053	1,145	1,092
Public EV charging plugs - DC Fast (1000 units)	0.024		0.247		1.08		1.74
Public EV charging plugs - L2 (1000 units)	0.374		5.92		25.9		41.8

Table 7: *E+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.86	12.4	57.2	90.9	95.9	96.2	96.2

Table 7: *E+ scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Resistance (%)	3.87	5.87	4.58	1.99	1.51	1.47	1.61
Sales of space heating units - Gas (%)	54.1	35.8	25.3	4.26	0.506	0.272	0.257
Sales of space heating units - Fossil (%)	37.2	45.9	12.9	2.88	2.05	2.02	1.96
Sales of water heating units - Electric Heat Pump (%)	0	1.46	13.8	34.6	38.2	38.4	38.4
Sales of water heating units - Electric Resistance (%)	22.1	39.5	47.7	59.4	61.4	61.5	61.5
Sales of water heating units - Gas Furnace (%)	65.5	51	36.9	5.9	0.348	0	0
Sales of water heating units - Other (%)	12.4	7.96	1.57	0.146	0.084	0.085	0.085
Sales of cooking units - Electric Resistance (%)	55.1	64.6	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.9	35.4	6.05	0.305	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.886	0.975				

Table 8: *E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.71	10.5	38.5	72.1	77.6	77.9	78
Sales of space heating units - Electric Resistance (%)	1.36	4.58	16.4	21.3	22	22.1	22
Sales of space heating units - Gas (%)	68.5	55	39.3	6.28	0.373	0	0
Sales of space heating units - Fossil (%)	27.4	29.9	5.75	0.244	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.43	3.46	15.8	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	7.28	12.2	23.8	48	52.2	52.5	52.5
Sales of water heating units - Gas (%)	88.4	80.6	58.5	9.33	0.552	0	0
Sales of water heating units - Other (%)	2.9	3.75	1.86	1.55	1.53	1.53	1.55
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,952	2,131				

Table 9: *E+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	1,997	625	804	804	3,235	3,816	3,816
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	152	264	310	362	422	489	563
Installed renewables - Solar - Base land use assumptions (MW)	105	105	652	652	652	652	652
Installed renewables - Wind - Base land use assumptions (MW)	91.4	91.4	91.4	91.4	91.4	91.4	91.4
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	268	681	906	906	906
Installed renewables - Solar - Constrained land use assumptions (MW)	11	11	1,010	1,010	1,010	1,010	1,010
Installed renewables - Wind - Constrained land use assumptions (MW)	91.4	91.4	91.4	91.4	91.4	91.4	91.4
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	73.2	617	793	793	793	793	793
Capital invested - Solar PV - Base (billion \$2018)		0	0.656	0	0	0	0
Capital invested - Wind - Base (billion \$2018)		0	0	0	0	0	0

Table 9: *E+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion \$2018)		0	0.829	1.04	0.454	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		0.137	0.725	0	0	0	0
Capital invested - Wind - Constrained (billion \$2018)		0	0	0	0	0	0
Capital invested - Offshore Wind - Constrained (billion \$2018)		2.08	0.546	0	0	0	0
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

Table 10: *E+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	220	220	1,203	1,203	1,203	1,203	1,203
Wind - Base land use assumptions (GWh)	371	371	371	371	371	371	371
OffshoreWind - Base land use assumptions (GWh)	0	0	1,073	2,717	3,631	3,631	3,631
Solar - Constrained land use assumptions (GWh)	0	0	1,788	1,788	1,788	1,788	1,788
Wind - Constrained land use assumptions (GWh)	371	371	371	371	371	371	371
OffshoreWind - Constrained land use assumptions (GWh)	0	0	1,073	2,717	3,631	3,631	3,631
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

Table 11: *E+ scenario - PILLAR 3: Clean fuels - Bioenergy*

Item	2020	2025	2030	2035	2040	2045	2050
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 - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	1
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 - 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
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	0	0	0	1,155
Biomass purchases (million \$2018/y)		0	0	0	0	0	46.4

Table 12: *E+ scenario - PILLAR 4: CCUS - CO2 capture*

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	1.48
Annual - BECCS (MMT)		0	0	0	0	0	1.48
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0

Table 12: *E+ scenario - PILLAR 4: CCUS - CO2 capture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - All (MMT)		0	0	0	0	0	1.48
Cumulative - BECCS (MMT)		0	0	0	0	0	1.48
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

Table 13: *E+ scenario - PILLAR 4: CCUS - CO2 pipelines*

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	79.2
All (km)		0	0	0	0	0	79.2
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	59.3
Cumulative investment - All (million \$2018)		0	0	0	0	0	59.3

Table 14: *E+ scenario - PILLAR 4: CCUS - CO2 storage*

Item	2020	2025	2030	2035	2040	2045	2050
Annual (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 15: *E+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-4.07
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-94.6
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-9.99
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-3.81
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-21.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-180
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-6.1
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-96.5
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-170
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0

Table 15: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-36.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-19.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-27
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-42.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-399
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-8.13
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-165
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-246
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-54.9
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-28.5
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-50.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-617
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-63.9
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.665
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							21
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							48.1
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)							1.43
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.247
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							12.8
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							84.3

Table 15: *E+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.997
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							21.7
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							86.8
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)							2.07
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							1.79
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.33
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							22.4
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							126
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)							2.71
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							1.43
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							21.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							175

Table 16: *E+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
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)							-5.39
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-0.164
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-5.55
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-10.3
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-0.327
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-10.7
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)							3.43
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							0.298
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3.72
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)							6.55
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							0.595
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							7.15

Table 17: *E- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		11.1	0.012	0.012	0.011	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.32	2.49	0.933	0.388	0.119	0.245
Premature deaths from air pollution - Mobile - On-Road (deaths)		37.8	38	36.8	32.9	26	17.7
Premature deaths from air pollution - Gas Stations (deaths)		1.74	1.74	1.67	1.48	1.16	0.784

Table 17: E- scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.67	7.08	6.35	5.32	4.03	2.67
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		14.7	13.9	13.1	11.2	8.15	4.96
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.11	1.1	1.07	0.976	0.79	0.574
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.235	0.224	0.212	0.2	0.188	0.175
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		6.78	6.51	6.18	5.63	4.82	3.86
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		4.64	4.32	3.96	3.37	2.79	2.16
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.649	0.582	0.516	0.451	0.388	0.327
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.09	0.048	0.048	0.047	0.047	0.045
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		6.29	5.44	4.39	3.6	3.02	2.16
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		98.3	0.103	0.103	0.098	0.06	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		56	22	8.27	3.44	1.06	2.17
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		336	338	327	292	231	157
Monetary damages from air pollution - Gas Stations (million \$2019)		15.4	15.4	14.8	13.1	10.3	6.94
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		68	62.8	56.2	47.1	35.7	23.7
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		131	123	116	99.6	72.2	44
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		9.87	9.73	9.47	8.64	7	5.08
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.08	1.98	1.88	1.77	1.66	1.55
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		60	57.6	54.7	49.9	42.7	34.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		41.1	38.2	35.1	29.8	24.7	19.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.75	5.15	4.57	3.99	3.43	2.9
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.796	0.427	0.424	0.419	0.417	0.398

Table 17: *E- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		55.9	48.3	39	31.9	26.9	19.2

Table 18: *E- scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		17.2	22	8.4	5.41	4.89	81.2
By economic sector - Construction (jobs)		1,125	1,230	879	880	1,086	1,772
By economic sector - Manufacturing (jobs)		476	552	544	494	740	1,102
By economic sector - Mining (jobs)		433	314	227	158	104	53
By economic sector - Other (jobs)		130	180	111	123	151	298
By economic sector - Pipeline (jobs)		102	83.9	68.4	56.9	45.5	48.3
By economic sector - Professional (jobs)		468	502	377	404	520	961
By economic sector - Trade (jobs)		437	438	332	323	368	594
By economic sector - Utilities (jobs)		770	624	557	591	967	1,635
By resource sector - Biomass (jobs)		65.2	59.2	27.9	22.7	20.8	335
By resource sector - CO2 (jobs)		0	0	0	0	0	145
By resource sector - Grid (jobs)		497	641	817	940	1,665	2,770
By resource sector - Natural Gas (jobs)		1,212	723	400	324	362	456
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,017	839	695	542	393	211
By resource sector - Solar (jobs)		1,052	1,393	709	752	926	1,593
By resource sector - Wind (jobs)		114	289	454	454	621	1,035
By education level - All sectors - High school diploma or less (jobs)		1,671	1,693	1,329	1,294	1,696	2,788
By education level - All sectors - Associates degree or some college (jobs)		1,233	1,230	967	956	1,280	2,102
By education level - All sectors - Bachelors degree (jobs)		828	802	635	615	794	1,291
By education level - All sectors - Masters or professional degree (jobs)		197	191	150	148	191	319
By education level - All sectors - Doctoral degree (jobs)		28.3	28.4	21.3	21.3	26.3	45.5
Related work experience - All sectors - None (jobs)		575	572	449	440	579	957
Related work experience - All sectors - Up to 1 year (jobs)		778	800	624	610	800	1,333
Related work experience - All sectors - 1 to 4 years (jobs)		1,433	1,419	1,118	1,093	1,432	2,340
Related work experience - All sectors - 4 to 10 years (jobs)		929	915	720	705	929	1,515
Related work experience - All sectors - Over 10 years (jobs)		243	240	192	187	248	400
On-the-Job Training - All sectors - None (jobs)		220	221	170	166	212	350
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,593	2,589	2,049	1,996	2,618	4,302
On-the-Job Training - All sectors - 1 to 4 years (jobs)		835	827	648	639	849	1,386
On-the-Job Training - All sectors - 4 to 10 years (jobs)		271	268	204	204	269	445
On-the-Job Training - All sectors - Over 10 years (jobs)		39.5	40.4	31.2	30.1	38.8	62.3
On-Site or In-Plant Training - All sectors - None (jobs)		641	643	501	490	641	1,060
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,356	2,350	1,860	1,813	2,379	3,903

Table 18: *E- scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		648	644	506	497	659	1,076
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		279	274	210	208	273	448
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		33.4	33.2	26.2	26.2	35.4	58.5
Wage income - All (million \$2019)		243	241	193	191	254	420

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	58.2	54.4	49.9	45.9	42.7	38.8	34.4
Final energy use - Residential (PJ)	45.6	43	41.1	39.3	36.3	32.3	28
Final energy use - Commercial (PJ)	37.9	36	35	34.2	33.1	31.9	30.6
Final energy use - Industry (PJ)	7.41	7.1	7.11	7.23	7.42	7.57	7.74

Table 20: *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)		0.246	0.245	0.466	0.491	0.969	1.05

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	4.2	25.1	46	143	240	454	669
Vehicle stocks - LDV – All others (1000 units)	874	874	874	829	784	604	425
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	27.1	56.8	192	604	880
Public EV charging plugs - DC Fast (1000 units)	0.024		0.077		0.4		1.12
Public EV charging plugs - L2 (1000 units)	0.374		1.84		9.6		26.8

Table 22: *E- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.86	5.74	10.9	26.2	53.8	78.8	90.8
Sales of space heating units - Electric Resistance (%)	3.87	5.91	5.68	5.25	4.15	2.68	1.92
Sales of space heating units - Gas (%)	54.1	36.3	34.9	31	21.7	10.2	3.52
Sales of space heating units - Fossil (%)	37.2	52.1	48.5	37.5	20.3	8.33	3.72
Sales of water heating units - Electric Heat Pump (%)	0	0.513	1.93	6.5	16.6	28.5	35.2
Sales of water heating units - Electric Resistance (%)	22.1	38.7	39.7	42.7	48.9	55.9	59.7
Sales of water heating units - Gas Furnace (%)	65.5	51.6	49.9	44.4	31.3	14.6	4.75
Sales of water heating units - Other (%)	12.4	9.19	8.47	6.4	3.18	1.08	0.344
Sales of cooking units - Electric Resistance (%)	54.9	56.1	60.2	71.1	86.2	95.6	98.8
Sales of cooking units - Gas (%)	45.1	43.9	39.8	28.9	13.8	4.45	1.2
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.888	1.03				

Table 23: E- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.71	7.42	10.6	20.5	40.4	61.4	72.8
Sales of space heating units - Electric Resistance (%)	1.36	2.46	3.76	7.72	14.3	19.2	21.2
Sales of space heating units - Gas (%)	68.5	55.5	53.2	47.3	33.4	15.6	5.09
Sales of space heating units - Fossil (%)	27.4	34.6	32.4	24.5	11.9	3.78	0.991
Sales of water heating units - Electric Heat Pump (%)	1.43	2.87	4.27	8.98	20.1	34	42.1
Sales of water heating units - Electric Resistance (%)	7.28	11.6	12.8	17.4	28	41.1	48.8
Sales of water heating units - Gas (%)	88.4	81.4	79.2	70.3	49.5	23.1	7.55
Sales of water heating units - Other (%)	2.9	4.09	3.79	3.25	2.39	1.79	1.62
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,952	2,132				

Table 24: E- scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	1,997	625	29	29	29	557	1,664
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

Table 25: E- scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-4.07
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-94.6
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-9.99
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-3.81
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-21.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-180
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-6.1
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-96.5
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-170
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-36.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-19.3

Table 25: E- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-27
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-42.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-399
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-8.13
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-165
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-246
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-54.9
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-28.5
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-50.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-617
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-63.9
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.665
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							21
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							48.1
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)							1.43
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.247
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							12.8
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							84.3
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.997

Table 25: 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)							21.7
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							86.8
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)							2.07
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							1.79
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.33
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							22.4
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							126
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)							2.71
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							1.43
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							21.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							175

Table 26: E- scenario - PILLAR 6: Land sinks - Agriculture

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0

Table 26: E- 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)							-5.39
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-0.164
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-5.55
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-10.3
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-0.327
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-10.7
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)							3.43
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							0.298
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3.72
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)							6.55
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							0.595
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							7.15

Table 27: E+RE+ scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		11.1	0.012	0.012	0.011	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.09	2.79	1.57	1.63	0.577	0.339
Premature deaths from air pollution - Mobile - On-Road (deaths)		37.1	34.4	26	14.9	6.64	2.42
Premature deaths from air pollution - Gas Stations (deaths)		1.7	1.54	1.14	0.659	0.301	0.122
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.64	6.58	4.66	2.66	1.29	0.502
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		14.5	11.4	7.59	4.28	1.81	0.546

Table 27: *E+RE+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.1	0.999	0.781	0.52	0.293	0.15
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.235	0.224	0.212	0.2	0.188	0.175
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		6.77	6	4.77	3.36	2.14	1.15
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		4.6	3.8	2.68	1.66	1.13	0.827
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.649	0.543	0.44	0.341	0.248	0.161
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.1	0.048	0.048	0.047	0.047	0.043
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		6.17	5.63	4.57	3.22	1.82	0.182
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		98.3	0.103	0.103	0.098	0.06	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		53.9	24.7	13.9	14.4	5.11	3.01
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		330	306	231	132	59.1	21.5
Monetary damages from air pollution - Gas Stations (million \$2019)		15	13.6	10.1	5.84	2.66	1.08
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		67.7	58.3	41.3	23.6	11.4	4.45
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		128	101	67.3	37.9	16.1	4.84
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		9.75	8.86	6.92	4.61	2.6	1.33
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.08	1.98	1.88	1.77	1.66	1.55
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		59.9	53.1	42.2	29.8	19	10.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		40.8	33.7	23.7	14.7	10	7.32
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.75	4.81	3.9	3.02	2.19	1.42
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.884	0.426	0.42	0.412	0.416	0.383
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		54.8	50	40.6	28.6	16.1	1.62

Table 28: E+RE+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		14.2	29.5	10.9	6.93	5.59	81
By economic sector - Construction (jobs)		1,134	1,270	1,166	1,452	1,451	1,970
By economic sector - Manufacturing (jobs)		485	583	840	715	842	1,104
By economic sector - Mining (jobs)		424	292	169	81.2	24.6	5.6
By economic sector - Other (jobs)		131	180	136	174	189	329
By economic sector - Pipeline (jobs)		99	81.6	55.8	33.8	15.8	7.9
By economic sector - Professional (jobs)		471	525	512	693	725	1,142
By economic sector - Trade (jobs)		436	430	367	431	433	664
By economic sector - Utilities (jobs)		792	714	1,074	1,712	1,665	1,964
By resource sector - Biomass (jobs)		55.2	83.1	29.3	22.6	20.8	356
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		564	951	1,853	2,662	2,893	3,555
By resource sector - Natural Gas (jobs)		1,184	620	433	866	529	437
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,004	760	492	253	67.7	0.008
By resource sector - Solar (jobs)		1,066	1,398	845	873	998	1,583
By resource sector - Wind (jobs)		113	293	679	621	843	1,335
By education level - All sectors - High school diploma or less (jobs)		1,683	1,766	1,853	2,231	2,256	3,069
By education level - All sectors - Associates degree or some college (jobs)		1,245	1,284	1,385	1,734	1,754	2,347
By education level - All sectors - Bachelors degree (jobs)		833	828	862	1,043	1,049	1,438
By education level - All sectors - Masters or professional degree (jobs)		198	198	205	256	258	361
By education level - All sectors - Doctoral degree (jobs)		28.3	29.1	27.3	34.1	34.6	52
Related work experience - All sectors - None (jobs)		579	596	629	777	781	1,061
Related work experience - All sectors - Up to 1 year (jobs)		784	834	869	1,038	1,060	1,472
Related work experience - All sectors - 1 to 4 years (jobs)		1,444	1,475	1,555	1,907	1,920	2,600
Related work experience - All sectors - 4 to 10 years (jobs)		936	951	1,009	1,250	1,258	1,689
Related work experience - All sectors - Over 10 years (jobs)		245	250	270	327	332	444
On-the-Job Training - All sectors - None (jobs)		221	228	229	275	278	386
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,611	2,694	2,847	3,434	3,480	4,762
On-the-Job Training - All sectors - 1 to 4 years (jobs)		842	863	922	1,159	1,165	1,548
On-the-Job Training - All sectors - 4 to 10 years (jobs)		273	279	290	382	379	502
On-the-Job Training - All sectors - Over 10 years (jobs)		39.7	41.5	42.5	49.1	50	67.7
On-Site or In-Plant Training - All sectors - None (jobs)		646	668	694	843	855	1,176
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,373	2,447	2,588	3,130	3,168	4,323
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		654	672	717	893	899	1,199
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		281	285	295	384	380	503
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		33.8	34.8	38.2	49.3	49.6	65.7
Wage income - All (million \$2019)		245	251	269	339	344	469

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	58.1	53.8	47.4	39.2	31.8	27.1	24.9
Final energy use - Residential (PJ)	45.6	42.8	39.4	34.2	28.6	24.4	21.9
Final energy use - Commercial (PJ)	37.9	36	34.2	31.9	29.5	27.8	26.7
Final energy use - Industry (PJ)	7.41	7.1	7.08	7.12	7.25	7.42	7.63

Table 30: 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)		0.337	0.347	1.19	1.3	1.08	1.15

Table 31: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	5.42	76.6	148	397	646	845	1,044
Vehicle stocks - LDV – All others (1000 units)	871	829	788	574	360	204	47.4
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		167	429	695	1,053	1,145	1,092
Public EV charging plugs - DC Fast (1000 units)	0.024		0.247		1.08		1.74
Public EV charging plugs - L2 (1000 units)	0.374		5.92		25.9		41.8

Table 32: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.86	12.4	57.2	90.9	95.9	96.2	96.2
Sales of space heating units - Electric Resistance (%)	3.87	5.87	4.58	1.99	1.51	1.47	1.61
Sales of space heating units - Gas (%)	54.1	35.8	25.3	4.26	0.506	0.272	0.257
Sales of space heating units - Fossil (%)	37.2	45.9	12.9	2.88	2.05	2.02	1.96
Sales of water heating units - Electric Heat Pump (%)	0	1.46	13.8	34.6	38.2	38.4	38.4
Sales of water heating units - Electric Resistance (%)	22.1	39.5	47.7	59.4	61.4	61.5	61.5
Sales of water heating units - Gas Furnace (%)	65.5	51	36.9	5.9	0.348	0	0
Sales of water heating units - Other (%)	12.4	7.96	1.57	0.146	0.084	0.085	0.085
Sales of cooking units - Electric Resistance (%)	55.1	64.6	94	99.7	100	100	100
Sales of cooking units - Gas (%)	44.9	35.4	6.05	0.305	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.886	0.975				

Table 33: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.71	10.5	38.5	72.1	77.6	77.9	78
Sales of space heating units - Electric Resistance (%)	1.36	4.58	16.4	21.3	22	22.1	22
Sales of space heating units - Gas (%)	68.5	55	39.3	6.28	0.373	0	0
Sales of space heating units - Fossil (%)	27.4	29.9	5.75	0.244	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.43	3.46	15.8	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	7.28	12.2	23.8	48	52.2	52.5	52.5
Sales of water heating units - Gas (%)	88.4	80.6	58.5	9.33	0.552	0	0
Sales of water heating units - Other (%)	2.9	3.75	1.86	1.55	1.53	1.53	1.55

Table 33: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,952	2,131				

Table 34: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity*

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	1,997	625	625	625	2,554	3,139	3,136
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	152	264	310	362	422	489	563
Installed renewables - Solar - Base land use assumptions (MW)	105	105	652	652	652	652	652
Installed renewables - Wind - Base land use assumptions (MW)	91.4	91.4	91.4	91.4	91.4	91.4	91.4
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	268	906	906	906	906
Installed renewables - Solar - Constrained land use assumptions (MW)	105	105	884	884	884	884	884
Installed renewables - Wind - Constrained land use assumptions (MW)	102	102	102	102	102	102	102
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	73.2	556	793	793	793	793	793
Capital invested - Solar PV - Base (billion \$2018)		0	0.656	0	0	0	0
Capital invested - Offshore Wind - Base (billion \$2018)		0	0.829	1.6	0	0	0

Table 35: *E+RE+ scenario - PILLAR 2: Clean Electricity - Generation*

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	220	220	1,207	1,207	1,207	1,207	1,207
Wind - Base land use assumptions (GWh)	371	371	371	371	371	371	371
OffshoreWind - Base land use assumptions (GWh)	0	0	1,073	3,631	3,631	3,631	3,631
Solar - Constrained land use assumptions (GWh)	440	440	3,237	3,237	3,237	3,237	3,237
Wind - Constrained land use assumptions (GWh)	742	742	742	742	742	742	742
OffshoreWind - Constrained land use assumptions (GWh)	593	4,469	6,342	6,342	6,342	6,342	6,342

Table 36: *E+RE+ scenario - PILLAR 6: Land sinks - Forests*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-4.07
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-94.6
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-9.99
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0

Table 36: E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-3.81
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-21.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-180
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-6.1
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-96.5
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-170
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-36.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-19.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-27
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-42.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-399
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-8.13
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-165
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-246
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-54.9
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-28.5
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-50.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-617
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-63.9
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.665
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							21
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							48.1
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 36: *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 trees outside forests (1000 hectares)							1.43
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.247
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							12.8
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							84.3
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.997
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							21.7
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							86.8
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)							2.07
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							1.79
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.33
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							22.4
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							126
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)							2.71
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0

Table 36: *E+RE+ scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							1.43
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							21.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							175

Table 37: *E+RE+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
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)							-5.39
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-0.164
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-5.55
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-10.3
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-0.327
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-10.7
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)							3.43
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							0.298
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3.72
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)							6.55
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							0.595
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							7.15

Table 38: *E+RE- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		11.1	0.012	0.012	0.011	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.37	3.65	3.85	2.93	1.56	0.38
Premature deaths from air pollution - Mobile - On-Road (deaths)		37.1	34.4	26	14.9	6.64	2.42
Premature deaths from air pollution - Gas Stations (deaths)		1.7	1.54	1.14	0.659	0.301	0.122
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.64	6.58	4.66	2.66	1.29	0.502
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		14.5	11.4	7.59	4.28	1.81	0.546
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.1	0.999	0.781	0.52	0.293	0.15
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.235	0.224	0.212	0.2	0.188	0.175
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		6.77	6	4.77	3.36	2.14	1.15
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		4.6	3.8	2.68	1.66	1.13	0.827
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.649	0.543	0.44	0.341	0.248	0.161
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.086	0.048	0.048	0.047	0.047	0.043
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		6.42	6.1	5.91	5.13	4.29	3.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		98.3	0.103	0.103	0.098	0.06	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		56.5	32.3	34.1	25.9	13.8	3.37
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		330	306	231	132	59.1	21.5
Monetary damages from air pollution - Gas Stations (million \$2019)		15	13.6	10.1	5.84	2.66	1.08
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		67.7	58.3	41.3	23.6	11.4	4.45
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		128	101	67.3	37.9	16.1	4.84
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		9.75	8.86	6.92	4.61	2.6	1.33
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.08	1.98	1.88	1.77	1.66	1.55
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		59.9	53.1	42.2	29.8	19	10.2

Table 38: *E+RE- scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		40.8	33.7	23.7	14.7	10	7.32
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.75	4.81	3.9	3.02	2.19	1.42
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.757	0.425	0.421	0.412	0.416	0.383
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		57	54.1	52.4	45.5	38.1	28.4

Table 39: *E+RE- scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		16.1	23.1	7.73	6.37	5.87	81.4
By economic sector - Construction (jobs)		1,132	861	1,030	1,358	1,167	1,566
By economic sector - Manufacturing (jobs)		553	409	473	459	327	566
By economic sector - Mining (jobs)		432	306	201	122	71	41.9
By economic sector - Other (jobs)		129	81.5	101	132	132	254
By economic sector - Pipeline (jobs)		104	89.7	78.1	64.4	49.2	57.8
By economic sector - Professional (jobs)		464	366	482	804	539	824
By economic sector - Trade (jobs)		433	329	336	434	331	486
By economic sector - Utilities (jobs)		798	762	1,495	3,195	1,768	1,928
By resource sector - Biomass (jobs)		56.5	59.2	26.5	23.8	23	338
By resource sector - CO2 (jobs)		0	0	0	0	0	164
By resource sector - Grid (jobs)		539	729	1,541	2,480	2,235	2,459
By resource sector - Natural Gas (jobs)		1,240	964	682	864	669	586
By resource sector - Nuclear (jobs)		0	0	649	2,166	540	532
By resource sector - Oil (jobs)		1,003	772	517	310	178	101
By resource sector - Solar (jobs)		1,006	482	515	534	547	1,390
By resource sector - Wind (jobs)		218	220	274	198	197	235
By education level - All sectors - High school diploma or less (jobs)		1,718	1,366	1,566	2,031	1,677	2,298
By education level - All sectors - Associates degree or some college (jobs)		1,269	1,011	1,187	1,602	1,303	1,742
By education level - All sectors - Bachelors degree (jobs)		847	669	754	1,012	778	1,055
By education level - All sectors - Masters or professional degree (jobs)		200	159	183	257	195	266
By education level - All sectors - Doctoral degree (jobs)		28.3	21.9	25.4	37.3	26.2	38.4
Related work experience - All sectors - None (jobs)		589	471	541	718	586	797
Related work experience - All sectors - Up to 1 year (jobs)		800	628	727	952	773	1,089
Related work experience - All sectors - 1 to 4 years (jobs)		1,470	1,171	1,343	1,789	1,435	1,934
Related work experience - All sectors - 4 to 10 years (jobs)		953	758	875	1,177	942	1,256
Related work experience - All sectors - Over 10 years (jobs)		250	199	230	304	242	324
On-the-Job Training - All sectors - None (jobs)		224	174	197	258	206	287
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,664	2,115	2,423	3,198	2,561	3,516
On-the-Job Training - All sectors - 1 to 4 years (jobs)		857	685	799	1,077	878	1,159

Table 39: *E+RE- scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 4 to 10 years (jobs)		275	221	262	362	299	389
On-the-Job Training - All sectors - Over 10 years (jobs)		40.8	31.1	35	44.3	35.5	49.4
On-Site or In-Plant Training - All sectors - None (jobs)		658	517	592	789	627	868
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,420	1,923	2,206	2,912	2,340	3,197
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		666	531	618	828	676	896
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		284	228	266	364	299	389
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		34.4	27.9	33.3	45.8	37.7	49.5
Wage income - All (million \$2019)		249	202	236	321	261	351

Table 40: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Overview*

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	58.1	53.8	47.4	39.2	31.8	27.1	24.9
Final energy use - Residential (PJ)	45.6	42.8	39.4	34.2	28.6	24.4	21.9
Final energy use - Commercial (PJ)	37.9	36	34.2	31.9	29.5	27.8	26.7
Final energy use - Industry (PJ)	7.41	7.1	7.08	7.12	7.25	7.42	7.63

Table 41: *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)		0.337	0.347	1.19	1.3	1.08	1.15

Table 42: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Transportation*

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	5.42	76.6	148	397	646	845	1,044
Vehicle stocks - LDV – All others (1000 units)	871	829	788	574	360	204	47.4
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		167	429	695	1,053	1,145	1,092
Public EV charging plugs - DC Fast (1000 units)	0.024		0.247		1.08		1.74
Public EV charging plugs - L2 (1000 units)	0.374		5.92		25.9		41.8

Table 43: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.86	12.4	57.2	90.9	95.9	96.2	96.2
Sales of space heating units - Electric Resistance (%)	3.87	5.87	4.58	1.99	1.51	1.47	1.61
Sales of space heating units - Gas (%)	54.1	35.8	25.3	4.26	0.506	0.272	0.257
Sales of space heating units - Fossil (%)	37.2	45.9	12.9	2.88	2.05	2.02	1.96
Sales of water heating units - Electric Heat Pump (%)	0	1.46	13.8	34.6	38.2	38.4	38.4
Sales of water heating units - Electric Resistance (%)	22.1	39.5	47.7	59.4	61.4	61.5	61.5
Sales of water heating units - Gas Furnace (%)	65.5	51	36.9	5.9	0.348	0	0
Sales of water heating units - Other (%)	12.4	7.96	1.57	0.146	0.084	0.085	0.085
Sales of cooking units - Electric Resistance (%)	55.1	64.6	94	99.7	100	100	100

Table 43: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Residential (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Gas (%)	44.9	35.4	6.05	0.305	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.886	0.975				

Table 44: E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.71	10.5	38.5	72.1	77.6	77.9	78
Sales of space heating units - Electric Resistance (%)	1.36	4.58	16.4	21.3	22	22.1	22
Sales of space heating units - Gas (%)	68.5	55	39.3	6.28	0.373	0	0
Sales of space heating units - Fossil (%)	27.4	29.9	5.75	0.244	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.43	3.46	15.8	41.2	45.7	46	46
Sales of water heating units - Electric Resistance (%)	7.28	12.2	23.8	48	52.2	52.5	52.5
Sales of water heating units - Gas (%)	88.4	80.6	58.5	9.33	0.552	0	0
Sales of water heating units - Other (%)	2.9	3.75	1.86	1.55	1.53	1.53	1.55
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,952	2,131				

Table 45: E+RE- scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	1,997	625	822	822	2,199	2,184	2,170
Installed thermal - Nuclear (MW)	0	0	0	272	1,141	1,141	1,141
Installed renewables - Rooftop PV (MW)	152	264	310	362	422	489	563
Installed renewables - Solar - Base land use assumptions (MW)	105	105	105	105	105	105	105
Installed renewables - Wind - Base land use assumptions (MW)	91.4	91.4	91.4	91.4	91.4	91.4	91.4
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	393	683	683	683	888
Installed renewables - Solar - Constrained land use assumptions (MW)	307	307	307	307	307	307	307
Installed renewables - Wind - Constrained land use assumptions (MW)	91.4	91.4	91.4	91.4	91.4	91.4	91.4
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	73.2	793	793	793	793	793	793
Capital invested - Solar PV - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Wind - Base (billion \$2018)		0	0	0	0	0	0
Capital invested - Offshore Wind - Base (billion \$2018)		0	1.22	0.529	0	0	0.271
Capital invested - Solar PV - Constrained (billion \$2018)		0	0	0	0	0	0
Capital invested - Wind - Constrained (billion \$2018)		0	0	0	0	0	0
Capital invested - Offshore Wind - Constrained (billion \$2018)		2.75	0	0	0	0	0

Table 46: E+RE- scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	220	220	220	220	220	220	220

Table 46: E+RE- scenario - PILLAR 2: Clean Electricity - Generation (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Wind - Base land use assumptions (GWh)	371	371	371	371	371	371	371
OffshoreWind - Base land use assumptions (GWh)	0	0	1,567	2,404	2,404	2,404	3,237
Solar - Constrained land use assumptions (GWh)	583	583	583	583	583	583	583
Wind - Constrained land use assumptions (GWh)	371	371	371	371	371	371	371
OffshoreWind - Constrained land use assumptions (GWh)	297	3,171	3,171	3,171	3,171	3,171	3,171

Table 47: E+RE- scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-4.07
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-94.6
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-9.99
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-3.81
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-21.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-180
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-6.1
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-96.5
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-170
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-36.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-19.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-27
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-42.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-399
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-8.13
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-165
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-246
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0

Table 47: E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-54.9
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-28.5
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-50.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-617
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-63.9
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.665
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							21
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							48.1
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)							1.43
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.247
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							12.8
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							84.3
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.997
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							21.7
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							86.8
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)							2.07
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							1.79

Table 47: *E+RE- scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.33
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							22.4
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							126
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)							2.71
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							1.43
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							21.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							175

Table 48: *E+RE- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
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)							-5.39
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-0.164
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-5.55
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-10.3
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-0.327
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-10.7

Table 48: *E+RE- scenario - PILLAR 6: Land sinks - Agriculture (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3.43
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							0.298
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3.72
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)							6.55
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							0.595
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							7.15

Table 49: *E-B+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		11.1	0.012	0.012	0.011	0.007	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.34	2.35	1.09	0.887	0.557	0.347
Premature deaths from air pollution - Mobile - On-Road (deaths)		37.8	38	36.8	32.9	26	17.7
Premature deaths from air pollution - Gas Stations (deaths)		1.74	1.74	1.67	1.48	1.16	0.784
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.67	7.08	6.35	5.32	4.03	2.67
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		14.7	13.9	13.1	11.2	8.15	4.96
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.11	1.1	1.07	0.976	0.79	0.574
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.235	0.224	0.212	0.2	0.188	0.175
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		6.78	6.51	6.18	5.63	4.82	3.86
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		4.64	4.32	3.96	3.37	2.79	2.16
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.649	0.582	0.516	0.451	0.388	0.327
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.093	0.048	0.048	0.048	0.048	0.047

Table 49: E-B+ scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		6.29	5.44	4.39	3.6	3.02	2.16
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		98.3	0.103	0.103	0.098	0.06	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		56.2	20.8	9.63	7.86	4.93	3.07
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		336	338	327	292	231	157
Monetary damages from air pollution - Gas Stations (million \$2019)		15.4	15.4	14.8	13.1	10.3	6.94
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		68	62.8	56.2	47.1	35.7	23.7
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		131	123	116	99.6	72.2	44
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		9.87	9.73	9.47	8.64	7	5.08
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.08	1.98	1.88	1.77	1.66	1.55
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		60	57.6	54.7	49.9	42.7	34.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		41.1	38.2	35.1	29.8	24.7	19.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.75	5.15	4.57	3.99	3.43	2.9
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		0.817	0.426	0.424	0.419	0.422	0.413
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		55.9	48.3	39	31.9	26.9	19.2

Table 50: E-B+ scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		15.7	22	8.23	6.09	5.05	103
By economic sector - Construction (jobs)		1,122	1,225	861	888	1,128	1,669
By economic sector - Manufacturing (jobs)		474	554	501	398	569	930
By economic sector - Mining (jobs)		431	314	228	166	103	48.8
By economic sector - Other (jobs)		130	178	108	119	147	284
By economic sector - Pipeline (jobs)		101	83.7	69.3	58.9	44.5	46.6
By economic sector - Professional (jobs)		467	502	367	399	518	940
By economic sector - Trade (jobs)		437	437	326	324	366	564
By economic sector - Utilities (jobs)		766	623	542	658	1,145	1,541
By resource sector - Biomass (jobs)		62.5	59.2	27.9	25.5	23.4	486
By resource sector - CO2 (jobs)		0	0	0	0	0	149
By resource sector - Grid (jobs)		498	641	780	995	1,894	2,625
By resource sector - Natural Gas (jobs)		1,202	721	410	412	503	412
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,017	839	695	573	396	192
By resource sector - Solar (jobs)		1,050	1,380	685	691	784	1,555

Table 50: E-B+ scenario - IMPACTS - Jobs (continued)

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Wind (jobs)		117	298	413	320	425	708
By education level - All sectors - High school diploma or less (jobs)		1,666	1,690	1,289	1,285	1,710	2,616
By education level - All sectors - Associates degree or some college (jobs)		1,229	1,228	938	952	1,300	1,955
By education level - All sectors - Bachelors degree (jobs)		826	801	617	611	796	1,210
By education level - All sectors - Masters or professional degree (jobs)		196	191	146	148	194	302
By education level - All sectors - Doctoral degree (jobs)		28.2	28.3	20.8	21.2	26.2	43.8
Related work experience - All sectors - None (jobs)		573	571	436	439	589	899
Related work experience - All sectors - Up to 1 year (jobs)		776	798	605	601	797	1,255
Related work experience - All sectors - 1 to 4 years (jobs)		1,429	1,416	1,086	1,089	1,449	2,189
Related work experience - All sectors - 4 to 10 years (jobs)		926	913	699	704	943	1,414
Related work experience - All sectors - Over 10 years (jobs)		242	239	186	184	248	371
On-the-Job Training - All sectors - None (jobs)		219	220	166	164	212	329
On-the-Job Training - All sectors - Up to 1 year (jobs)		2,585	2,585	1,987	1,976	2,624	4,033
On-the-Job Training - All sectors - 1 to 4 years (jobs)		832	826	629	639	869	1,290
On-the-Job Training - All sectors - 4 to 10 years (jobs)		270	267	199	208	284	418
On-the-Job Training - All sectors - Over 10 years (jobs)		39.4	40.3	30.2	29.2	37.8	57.4
On-Site or In-Plant Training - All sectors - None (jobs)		640	642	486	484	640	992
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		2,349	2,347	1,804	1,797	2,390	3,658
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		646	643	491	497	672	1,001
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		278	273	205	212	286	420
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		33.3	33.2	25.4	26.3	36.6	54.7
Wage income - All (million \$2019)		242	240	187	191	260	394

Table 51: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	58.2	54.4	49.9	45.9	42.7	38.8	34.4
Final energy use - Residential (PJ)	45.6	43	41.1	39.3	36.3	32.3	28
Final energy use - Commercial (PJ)	37.9	36	35	34.2	33.1	31.9	30.6
Final energy use - Industry (PJ)	7.41	7.1	7.11	7.23	7.42	7.57	7.74

Table 52: 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)		0.246	0.245	0.466	0.491	0.969	1.05

Table 53: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Transportation

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	4.2	25.1	46	143	240	454	669
Vehicle stocks - LDV – All others (1000 units)	874	874	874	829	784	604	425
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	27.1	56.8	192	604	880
Public EV charging plugs - DC Fast (1000 units)	0.024		0.077		0.4		1.12
Public EV charging plugs - L2 (1000 units)	0.374		1.84		9.6		26.8

Table 54: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.86	5.74	10.9	26.2	53.8	78.8	90.8
Sales of space heating units - Electric Resistance (%)	3.87	5.91	5.68	5.25	4.15	2.68	1.92
Sales of space heating units - Gas (%)	54.1	36.3	34.9	31	21.7	10.2	3.52
Sales of space heating units - Fossil (%)	37.2	52.1	48.5	37.5	20.3	8.33	3.72
Sales of water heating units - Electric Heat Pump (%)	0	0.513	1.93	6.5	16.6	28.5	35.2
Sales of water heating units - Electric Resistance (%)	22.1	38.7	39.7	42.7	48.9	55.9	59.7
Sales of water heating units - Gas Furnace (%)	65.5	51.6	49.9	44.4	31.3	14.6	4.75
Sales of water heating units - Other (%)	12.4	9.19	8.47	6.4	3.18	1.08	0.344
Sales of cooking units - Electric Resistance (%)	54.9	56.1	60.2	71.1	86.2	95.6	98.8
Sales of cooking units - Gas (%)	45.1	43.9	39.8	28.9	13.8	4.45	1.2
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.888	1.03				

Table 55: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.71	7.42	10.6	20.5	40.4	61.4	72.8
Sales of space heating units - Electric Resistance (%)	1.36	2.46	3.76	7.72	14.3	19.2	21.2
Sales of space heating units - Gas (%)	68.5	55.5	53.2	47.3	33.4	15.6	5.09
Sales of space heating units - Fossil (%)	27.4	34.6	32.4	24.5	11.9	3.78	0.991
Sales of water heating units - Electric Heat Pump (%)	1.43	2.87	4.27	8.98	20.1	34	42.1
Sales of water heating units - Electric Resistance (%)	7.28	11.6	12.8	17.4	28	41.1	48.8
Sales of water heating units - Gas (%)	88.4	81.4	79.2	70.3	49.5	23.1	7.55
Sales of water heating units - Other (%)	2.9	4.09	3.79	3.25	2.39	1.79	1.62
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,952	2,132				

Table 56: E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	1,997	625	29	29	481	1,571	1,843
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0

Table 56: E-B+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

Item	2020	2025	2030	2035	2040	2045	2050
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

Table 57: 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 power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

Table 58: E-B+ scenario - PILLAR 3: Clean fuels - Bioenergy

Item	2020	2025	2030	2035	2040	2045	2050
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 - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	1
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 - 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
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	0	0	0	1,510
Biomass purchases (million \$2018/y)		0	0	0	0	0	114

Table 59: E-B+ scenario - PILLAR 4: CCUS - CO2 capture

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0	0	0	1.94
Annual - BECCS (MMT)		0	0	0	0	0	1.94
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0	0	0	1.94
Cumulative - BECCS (MMT)		0	0	0	0	0	1.94
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

Table 60: E-B+ scenario - PILLAR 4: CCUS - CO2 pipelines

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	0	0	0	0
Spur (km)		0	0	0	0	0	79.2
All (km)		0	0	0	0	0	79.2
Cumulative investment - Trunk (million \$2018)		0	0	0	0	0	0
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	65.6
Cumulative investment - All (million \$2018)		0	0	0	0	0	65.6

Table 61: E-B+ scenario - PILLAR 4: CCUS - CO2 storage

Item	2020	2025	2030	2035	2040	2045	2050
Annual (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 62: E-B+ scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-4.07
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-94.6
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-9.99
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-3.81
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-21.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-180
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-6.1
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-96.5
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-170
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-36.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-19.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-27
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-42.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-399
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-8.13
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-165
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-246
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-54.9

Table 62: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-28.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-50.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-617
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-63.9
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.665
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							21
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							48.1
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)							1.43
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.247
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							12.8
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							84.3
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.997
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							21.7
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							86.8
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)							2.07
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							1.79

Table 62: E-B+ scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.33
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							22.4
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							126
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)							2.71
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							1.43
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							21.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							175

Table 63: E-B+ scenario - PILLAR 6: Land sinks - Agriculture

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)							-5.39
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-0.164
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 - Total (1000 tCO2e/y)							-5.55
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-10.3

Table 63: E-B+ scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-0.327
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 - Total (1000 tCO2e/y)							-10.7
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)							3.43
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							0.298
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)							0.047
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3.77
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)							16.2
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							0.595
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)							0.047
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							16.8

Table 64: REF scenario - IMPACTS - Health

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		30.7	19.2	17.8	17.4	17	15.2
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		5.02	3.28	4.37	6.14	5.69	5.17
Premature deaths from air pollution - Mobile - On-Road (deaths)		37.7	38.5	39.1	39.9	40.7	41.5
Premature deaths from air pollution - Gas Stations (deaths)		1.73	1.75	1.77	1.8	1.83	1.85

Table 64: REF scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		7.66	7.44	7.55	7.7	7.77	7.67
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		14.3	11.6	7.87	4.88	2.91	1.87
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.1	1.08	1.06	1.05	1.04	1.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.246	0.245	0.244	0.242	0.239	0.235
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		6.92	7.03	6.92	6.8	6.88	7.15
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		4.65	4.19	3.48	2.57	1.99	1.61
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.678	0.691	0.702	0.71	0.717	0.721
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.176	0.127	0.107	0.102	0.099	0.094
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		6.34	6.78	7	6.66	6.66	6.36
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		272	170	158	154	151	135
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		44.5	29	38.7	54.4	50.4	45.8
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		335	342	348	355	362	369
Monetary damages from air pollution - Gas Stations (million \$2019)		15.3	15.5	15.7	16	16.2	16.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		67.9	65.9	66.9	68.3	68.8	67.9
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		127	103	69.8	43.2	25.8	16.5
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		9.75	9.59	9.41	9.31	9.21	9.12
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.17	2.17	2.16	2.14	2.12	2.08
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		61.3	62.2	61.3	60.2	60.9	63.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		41.1	37.1	30.8	22.7	17.6	14.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		6	6.11	6.21	6.29	6.35	6.39
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		1.55	1.12	0.943	0.899	0.875	0.825

Table 64: REF scenario - IMPACTS - Health (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		56.3	60.2	62.1	59.1	59.1	56.5

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		14.9	13.4	13.2	10.8	10.7	11.6
By economic sector - Construction (jobs)		599	766	954	1,117	1,264	1,717
By economic sector - Manufacturing (jobs)		323	328	488	381	413	616
By economic sector - Mining (jobs)		438	351	284	231	196	166
By economic sector - Other (jobs)		20.9	67.6	88.3	110	125	252
By economic sector - Pipeline (jobs)		104	107	107	102	103	102
By economic sector - Professional (jobs)		283	291	364	454	504	716
By economic sector - Trade (jobs)		317	307	325	364	389	543
By economic sector - Utilities (jobs)		732	546	863	1,193	1,407	1,664
By resource sector - Biomass (jobs)		57.5	53.9	50	44.7	45.7	46.5
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Grid (jobs)		438	463	1,059	1,424	1,903	2,436
By resource sector - Natural Gas (jobs)		1,230	849	911	1,179	1,153	1,136
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		1,024	859	748	690	658	637
By resource sector - Solar (jobs)			452	489	512	527	1,249
By resource sector - Wind (jobs)		80.2	99	232	112	126	284
By education level - All sectors - High school diploma or less (jobs)		1,168	1,181	1,491	1,678	1,878	2,470
By education level - All sectors - Associates degree or some college (jobs)		872	856	1,101	1,273	1,425	1,875
By education level - All sectors - Bachelors degree (jobs)		624	584	708	794	871	1,130
By education level - All sectors - Masters or professional degree (jobs)		146	137	167	192	211	276
By education level - All sectors - Doctoral degree (jobs)		19.4	19	22.1	25.5	27.6	37.3
Related work experience - All sectors - None (jobs)		412	404	510	585	653	856
Related work experience - All sectors - Up to 1 year (jobs)		528	541	682	762	851	1,139
Related work experience - All sectors - 1 to 4 years (jobs)		1,041	1,010	1,263	1,436	1,598	2,087
Related work experience - All sectors - 4 to 10 years (jobs)		673	650	818	937	1,042	1,357
Related work experience - All sectors - Over 10 years (jobs)		177	171	215	242	269	351
On-the-Job Training - All sectors - None (jobs)		153	153	186	208	229	306
On-the-Job Training - All sectors - Up to 1 year (jobs)		1,868	1,825	2,283	2,565	2,852	3,748
On-the-Job Training - All sectors - 1 to 4 years (jobs)		595	584	745	863	966	1,259
On-the-Job Training - All sectors - 4 to 10 years (jobs)		188	188	241	289	325	423
On-the-Job Training - All sectors - Over 10 years (jobs)		26.2	27.1	33.6	36.6	40.2	53.8
On-Site or In-Plant Training - All sectors - None (jobs)		450	444	553	624	691	917
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		1,698	1,660	2,079	2,341	2,606	3,420

Table 65: REF scenario - IMPACTS - Jobs (continued)

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		462	454	579	666	746	974
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		197	195	247	294	329	425
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		23.8	23.3	30.6	36.3	40.9	53.3
Wage income - All (million \$2019)		179	174	221	257	290	380

Table 66: REF scenario - PILLAR 1: Efficiency/Electrification - Overview

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	58.1	54.5	50.5	48.1	48.2	49.7	51.5
Final energy use - Residential (PJ)	45.6	43.2	42	41.3	40.8	40.5	40.2
Final energy use - Commercial (PJ)	37.8	36.8	37.1	37.1	37.2	38.2	39.8
Final energy use - Industry (PJ)	7.42	7.31	7.55	7.93	8.42	8.89	9.39

Table 67: 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)		0.245	0.243	0.8	0.865	0.782	0.829

Table 68: REF scenario - PILLAR 1: Efficiency/Electrification - Residential

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	4.66	8.08	8.4	8.88	9.08	9.28	9.55
Sales of space heating units - Electric Resistance (%)	3.9	5.72	5.6	5.54	5.52	5.25	5.08
Sales of space heating units - Gas (%)	54.2	41.1	62.8	77.8	78.6	78.8	78.7
Sales of space heating units - Fossil (%)	37.3	45.1	23.2	7.8	6.77	6.71	6.7
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	22.1	38.4	38.4	38.4	38.4	38.4	38.4
Sales of water heating units - Gas Furnace (%)	65.5	52.1	52.2	52.1	52.1	52.1	52.1
Sales of water heating units - Other (%)	12.4	9.45	9.45	9.48	9.5	9.51	9.52
Sales of cooking units - Electric Resistance (%)	54.5	54.5	54.5	54.5	54.5	54.5	54.5
Sales of cooking units - Gas (%)	45.5	45.5	45.5	45.5	45.5	45.5	45.5
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		0.864	0.9				

Table 69: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.71	12.7	40.8	63.9	67.6	67.9	68
Sales of space heating units - Electric Resistance (%)	1.36	2.89	7.67	20	30.2	31.9	32
Sales of space heating units - Gas (%)	68.5	51	27.9	6.76	0.86	0.048	0
Sales of space heating units - Fossil (%)	27.4	33.4	23.6	9.33	1.34	0.106	0
Sales of water heating units - Electric Heat Pump (%)	1.43	2.35	2.32	2.33	2.32	2.34	2.33
Sales of water heating units - Electric Resistance (%)	7.28	11.1	10.9	11.1	11.1	11	11
Sales of water heating units - Gas (%)	88.4	82.4	82.7	82.5	82.5	82.7	82.6
Sales of water heating units - Other (%)	2.9	4.16	4.07	4.09	4.16	4	4.05

Table 69: REF scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)

Item	2020	2025	2030	2035	2040	2045	2050
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
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		1,928	1,983				

Table 70: REF scenario - PILLAR 2: Clean Electricity - Generating capacity

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Natural gas (MW)	1,997	625	625	898	1,679	3,041	3,637
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	152	264	310	362	422	489	563
Installed renewables - Solar - Base land use assumptions (MW)	69.2	69.2	69.2	69.2	69.2	69.2	69.2
Installed renewables - Wind - Base land use assumptions (MW)	88.4	88.4	88.4	88.4	88.4	88.4	88.4
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	0	1,173
Installed renewables - Solar - Constrained land use assumptions (MW)	35.7	35.7	35.7	35.7	35.7	35.7	35.7
Installed renewables - Wind - Constrained land use assumptions (MW)	3	3	3	3	3	3	3

Table 71: REF scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	220	220	220	220	220	220	220
Wind - Base land use assumptions (GWh)	371	371	371	371	371	371	371
Offshore Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

Table 72: 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 CO ₂ e/y)	-1.01		-0.322				-0.288
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO ₂ e/y)	-0.015		-0.027				-0.028
Business-as-usual carbon sink - Total (Mt CO ₂ e/y)	-1.02		-0.349				-0.316

Table 73: REF scenario - PILLAR 6: Land sinks - Forests

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO ₂ e/y)							-4.07
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-27.6
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-94.6
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							0
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-18.3
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-9.99
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							0
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-3.81

Table 73: REF scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-21.5
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-180
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-6.1
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-96.5
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-170
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-36.6
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-19.3
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-27
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-42.7
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-399
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-8.13
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-165
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-246
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							0
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-54.9
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-28.5
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							0
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-50.3
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-617
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-63.9
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							0.665
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							21
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							48.1
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 73: REF scenario - PILLAR 6: Land sinks - Forests (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							1.43
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							0.247
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							12.8
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							84.3
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							0.997
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							21.7
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							86.8
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)							2.07
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							1.79
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							25.8
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							139
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							1.33
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							22.4
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							126
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)							2.71
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							0

Table 73: *REF scenario - PILLAR 6: Land sinks - Forests (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							1.43
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							21.2
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							175