



Net-Zero America - Indiana data

October 29, 2021 (updated January 9, 2022)

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.9	17.2	11.6	10	5.42	2.25
Premature deaths from air pollution - Mobile - On-Road (deaths)		204	190	144	83.2	38.1	15.3
Premature deaths from air pollution - Gas Stations (deaths)		18.9	17.3	13	7.7	3.75	1.78
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.6	28.7	20.2	11.5	5.41	1.88
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.92	1.56	1.08	0.633	0.281	0.106
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.05	4.77	3.82	2.58	1.38	0.607
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.1	24.5	18.9	12.1	6.74	3.27
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.56	2.97	2.32	1.67	1.12	0.704
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.05	1.66	1.29	0.94	0.614
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.51	0.833	0.802	0.762	0.747	0.724
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		77.7	73.4	67.3	52.2	39	24.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		203	153	103	88.6	48	19.9
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,813	1,690	1,283	740	339	136
Monetary damages from air pollution - Gas Stations (million \$2019)		167	153	115	68.1	33.2	15.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		298	254	179	102	47.9	16.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17	13.9	9.55	5.61	2.49	0.943
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		44.8	42.2	33.8	22.8	12.3	5.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		240	217	167	107	59.6	28.9

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)		31.5	26.3	20.6	14.8	9.93	6.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		21.7	18.2	14.7	11.4	8.32	5.44
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		22.2	7.35	7.08	6.72	6.59	6.39
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		690	651	598	463	347	216

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,024	2,048	1,949	1,975	3,890	2,868
By economic sector - Construction (jobs)		8,873	19,891	28,086	26,019	24,844	26,722
By economic sector - Manufacturing (jobs)		5,112	5,696	7,074	6,867	7,228	7,614
By economic sector - Mining (jobs)		3,873	2,301	1,595	1,045	704	486
By economic sector - Other (jobs)		635	2,680	4,473	3,907	3,473	4,004
By economic sector - Pipeline (jobs)		751	905	535	409	381	291
By economic sector - Professional (jobs)		5,239	9,129	13,410	14,462	18,461	19,968
By economic sector - Trade (jobs)		4,585	6,357	8,816	8,538	9,151	10,371
By economic sector - Utilities (jobs)		10,335	13,780	19,845	21,812	22,350	24,031
By resource sector - Biomass (jobs)		4,782	4,683	4,346	5,238	14,281	12,573
By resource sector - CO2 (jobs)		26.8	2,275	376	439	1,369	1,311
By resource sector - Coal (jobs)		4,776	1,153	227	191	168	148
By resource sector - Grid (jobs)		11,579	19,179	34,267	38,527	39,993	44,374
By resource sector - Natural Gas (jobs)		7,694	6,136	5,869	5,252	3,344	2,282
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,069	4,885	3,582	2,434	1,622	998
By resource sector - Solar (jobs)		1,943	15,977	25,297	18,231	12,827	13,783
By resource sector - Wind (jobs)		4,555	8,498	11,819	14,723	16,876	20,886
By education level - All sectors - High school diploma or less (jobs)		18,273	27,549	37,223	36,305	38,391	40,275
By education level - All sectors - Associates degree or some college (jobs)		12,482	19,599	27,180	27,032	28,045	30,231
By education level - All sectors - Bachelors degree (jobs)		8,354	12,146	16,540	16,731	18,394	19,766
By education level - All sectors - Masters or professional degree (jobs)		2,034	3,038	4,202	4,311	4,863	5,236
By education level - All sectors - Doctoral degree (jobs)		283	455	636	656	788	847
Related work experience - All sectors - None (jobs)		6,135	9,300	12,654	12,495	13,271	14,058
Related work experience - All sectors - Up to 1 year (jobs)		8,789	13,304	17,992	17,470	18,709	19,681
Related work experience - All sectors - 1 to 4 years (jobs)		14,712	22,154	30,377	30,351	32,433	34,583
Related work experience - All sectors - 4 to 10 years (jobs)		9,337	14,343	19,708	19,679	20,764	22,319
Related work experience - All sectors - Over 10 years (jobs)		2,453	3,687	5,052	5,041	5,304	5,714
On-the-Job Training - All sectors - None (jobs)		2,237	3,447	4,700	4,589	4,901	5,240
On-the-Job Training - All sectors - Up to 1 year (jobs)		27,862	41,136	55,887	55,471	59,906	63,481

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,316	13,141	18,168	18,058	18,642	20,055
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,642	4,460	6,211	6,137	6,244	6,735
On-the-Job Training - All sectors - Over 10 years (jobs)		368	603	815	778	787	843
On-Site or In-Plant Training - All sectors - None (jobs)		6,527	10,108	13,837	13,739	14,816	15,761
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,290	37,407	50,867	50,412	54,119	57,442
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,518	10,211	14,087	13,971	14,465	15,524
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,735	4,498	6,214	6,141	6,286	6,771
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		355	564	778	772	795	857
Wage income - All (million \$2019)		2,210	3,334	4,600	4,658	5,042	5,445

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		125	109	84.3	61.1	42.8	28
Oil consumption - Cumulative (million bbls)							2,596
Oil production - Annual (million bbls)		2.18	2.19	2.19	1.73	1.41	0.937
Natural gas consumption - Annual (tcf)		661	557	447	336	212	147
Natural gas consumption - Cumulative (tcf)							13,461
Natural gas production - Annual (tcf)		6.17	5.83	5.08	4.3	3.41	2.65

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	652	610	534	441	358	306	285
Final energy use - Residential (PJ)	311	288	267	232	196	169	152
Final energy use - Commercial (PJ)	190	187	179	166	151	140	135
Final energy use - Industry (PJ)	680	692	706	721	751	767	776

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)		4.81	4.97	8.01	8.51	7.33	7.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	24.8	531	1,037	2,808	4,580	5,996	7,411
Vehicle stocks - LDV – All others (1000 units)	6,180	5,884	5,589	4,073	2,557	1,447	336
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,189	3,044	4,939	7,479	8,143	7,762
Public EV charging plugs - DC Fast (1000 units)	0.168		2.17		9.57		15.5
Public EV charging plugs - L2 (1000 units)	0.43		52.1		230		372

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 (%)	714	16.5	45.4	84.9	91.7	92.1	91.9
Sales of space heating units - Electric Resistance (%)	18.1	24.2	17.6	8.04	6.29	6.24	6.46
Sales of space heating units - Gas (%)	68.7	49.9	30.9	4.83	0.406	0.132	0.133
Sales of space heating units - Fossil (%)	6.08	9.3	6.1	2.21	1.58	1.53	1.49
Sales of water heating units - Electric Heat Pump (%)	0	2.32	17.1	34.9	37.8	38	38.1
Sales of water heating units - Electric Resistance (%)	39.3	55.4	55.8	60.8	61.7	61.8	61.7
Sales of water heating units - Gas Furnace (%)	60.6	42.1	26.8	4.14	0.241	0	0
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.203	0.201	0.202	0.203
Sales of cooking units - Electric Resistance (%)	67.6	74.5	95.6	99.8	100	100	100
Sales of cooking units - Gas (%)	32.4	25.5	4.36	0.22	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.74	7.82				

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 (%)	2.05	9.66	38.6	81.8	89.2	89.7	89.7
Sales of space heating units - Electric Resistance (%)	6.04	3.52	5.22	9.16	9.92	9.96	9.94
Sales of space heating units - Gas Furnace (%)	88.9	84.5	55.7	9.03	0.86	0.359	0.36
Sales of space heating units - Fossil (%)	3.02	2.32	0.438	0.019	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.622	3.21	22.6	47.9	52.2	52.5	52.5
Sales of water heating units - Electric Resistance (%)	5.71	4.94	19	42.9	47.1	47.4	47.4
Sales of water heating units - Gas Furnace (%)	93.3	91.7	58.2	8.97	0.524	0	0
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		19,994	21,829				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	6,680	0	0	0	0	0
Installed thermal - Natural gas (MW)	8,452	7,917	9,037	14,467	14,459	9,685	9,573
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	98.1	147	195	258	334	421	520
Installed renewables - Solar - Base land use assumptions (MW)	128	839	11,858	29,639	37,430	39,496	42,109
Installed renewables - Wind - Base land use assumptions (MW)	2,516	3,368	24,947	40,707	51,343	51,428	51,428
Installed renewables - Solar - Constrained land use assumptions (MW)	73	1,898	19,259	36,169	43,384	45,305	46,218
Installed renewables - Wind - Constrained land use assumptions (MW)	3,368	3,368	10,841	10,841	10,841	10,841	10,841
Capital invested - Solar PV - Base (billion \$2018)		0.952	13.2	19.6	8.1	2.03	2.42

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion \$2018)		0	28.7	19.6	12.6	0.095	0
Capital invested - Solar PV - Constrained (billion \$2018)		1.79	15.2	20	8.27	4.43	1.1
Capital invested - Wind - Constrained (billion \$2018)		0	9.95	0	0	0	7.78
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	0.006	0.021	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0.909	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	245	1,525	21,352	53,256	67,126	70,803	75,356
Wind - Base land use assumptions (GWh)	12,511	12,511	82,281	129,936	160,359	160,578	160,578
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	36.1	3,293	34,491	64,799	77,634	81,001	82,579
Wind - Constrained land use assumptions (GWh)	12,511	12,511	34,458	34,458	34,458	34,458	34,458
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	1,020	1,020
Biomass w/ccu allam power plant (GWh)	0	0	0	0	6.38	27.4	27.4

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	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	2	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	9	46	47
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	2	2
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	2	2
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	7,842	34,786	704
Biomass purchases (million \$2018/y)		0	0	0	531	2,880	2,928

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	1.08	11.5	59.5	60.5
Annual - BECCS (MMT)		0	0	0	10.1	54.7	55.6
Annual - NGCC (MMT)		0	0	1.08	1.43	1.45	1.36
Annual - Cement and lime (MMT)		0	0	0	0	3.42	3.53
Cumulative - All (MMT)		0	0	1.08	12.6	72.1	133
Cumulative - BECCS (MMT)		0	0	0	10.1	64.7	120

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - NGCC (MMT)		0	0	1.08	2.51	3.96	5.32
Cumulative - Cement and lime (MMT)		0	0	0	0	3.42	6.95

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	465	467	467	467	467
Spur (km)		0	34.3	292	321	1,930	2,245
All (km)		0	499	758	788	2,397	2,712
Cumulative investment - Trunk (million \$2018)		0	2,355	2,368	2,368	2,368	2,368
Cumulative investment - Spur (million \$2018)		0	57.6	249	302	1,997	2,228
Cumulative investment - All (million \$2018)		0	2,413	2,617	2,670	4,365	4,596

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.1	1.76	3.61	6.02	7.46
Injection wells (wells)		0	1	4	8	13	16
Resource characterization, appraisal, permitting costs (million \$2020)		50.6	142	182	182	182	182
Wells and facilities construction costs (million \$2020)		0	33.7	131	234	391	485

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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51

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 - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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 tCO2e/y)							-1,845

Table 16: E+ scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,936
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-117
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,898
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,845
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,474
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-234
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-9,552
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,104
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							213
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,124
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,995
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							425
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,228

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		24.1	15.6	6.61	3.05	1.03	0.695
Premature deaths from air pollution - Mobile - On-Road (deaths)		207	209	203	183	145	99.7
Premature deaths from air pollution - Gas Stations (deaths)		19.3	19.4	18.6	16.6	13.2	9.1
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.7	30.6	27.2	22.9	17.5	11.7
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.95	1.87	1.77	1.54	1.17	0.78

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.09	5.17	5.17	4.82	3.91	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.2	26.4	25.2	22.6	18.5	13.7
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.57	3.3	3.03	2.63	2.14	1.68
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.2	1.95	1.71	1.47	1.25
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.4	0.837	0.817	0.787	0.75	0.676
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		77.5	71.1	63	55.8	49.7	34.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		213	138	58.6	27	9.17	6.15
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,843	1,859	1,807	1,625	1,292	887
Monetary damages from air pollution - Gas Stations (million \$2019)		171	172	165	147	117	80.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		299	271	241	203	155	104
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17.3	16.5	15.7	13.7	10.3	6.91
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		45.1	45.8	45.8	42.7	34.6	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		241	234	223	200	164	121
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		31.6	29.2	26.8	23.2	19	14.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		21.7	19.5	17.3	15.1	13	11.1
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		21.2	7.38	7.21	6.94	6.62	5.97
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		688	632	559	496	441	305

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,029	2,037	1,945	2,717	5,400	2,866
By economic sector - Construction (jobs)		9,012	20,916	23,910	23,765	27,669	29,083
By economic sector - Manufacturing (jobs)		5,211	5,800	6,350	7,151	9,780	8,846
By economic sector - Mining (jobs)		3,904	2,366	1,819	1,395	1,093	762
By economic sector - Other (jobs)		651	2,793	3,763	3,500	3,668	4,232
By economic sector - Pipeline (jobs)		753	1,079	555	484	585	475
By economic sector - Professional (jobs)		5,333	9,364	11,654	15,065	23,308	21,833
By economic sector - Trade (jobs)		4,666	6,556	7,878	8,592	11,095	11,510
By economic sector - Utilities (jobs)		10,455	14,259	15,852	18,780	24,769	25,691
By resource sector - Biomass (jobs)		4,789	4,651	4,341	9,472	22,997	12,156
By resource sector - CO2 (jobs)		27.1	3,880	649	771	2,348	2,224
By resource sector - Coal (jobs)		4,904	1,244	232	199	169	136
By resource sector - Grid (jobs)		11,728	18,764	27,361	32,970	43,998	46,688
By resource sector - Natural Gas (jobs)		7,687	5,723	4,308	4,118	3,231	2,496
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,132	5,208	4,437	3,629	2,830	1,823
By resource sector - Solar (jobs)		2,043	16,857	21,089	15,974	12,948	13,782
By resource sector - Wind (jobs)		4,704	8,844	11,310	14,318	18,846	25,993
By education level - All sectors - High school diploma or less (jobs)		18,519	28,586	32,088	34,831	45,551	43,830
By education level - All sectors - Associates degree or some college (jobs)		12,665	20,394	23,147	25,356	32,675	33,084
By education level - All sectors - Bachelors degree (jobs)		8,479	12,580	14,306	16,352	22,255	21,715
By education level - All sectors - Masters or professional degree (jobs)		2,064	3,139	3,631	4,239	5,902	5,738
By education level - All sectors - Doctoral degree (jobs)		287	470	556	672	984	930
Related work experience - All sectors - None (jobs)		6,218	9,656	10,867	11,954	15,732	15,324
Related work experience - All sectors - Up to 1 year (jobs)		8,907	13,776	15,579	16,972	22,476	21,410
Related work experience - All sectors - 1 to 4 years (jobs)		14,925	22,998	26,079	29,037	38,408	37,827
Related work experience - All sectors - 4 to 10 years (jobs)		9,474	14,913	16,869	18,689	24,470	24,463
Related work experience - All sectors - Over 10 years (jobs)		2,489	3,826	4,334	4,798	6,280	6,275
On-the-Job Training - All sectors - None (jobs)		2,270	3,575	4,068	4,463	5,895	5,725
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,255	42,615	48,230	53,714	71,812	69,334
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,436	13,688	15,467	16,872	21,605	21,955
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,679	4,662	5,259	5,662	7,129	7,354
On-the-Job Training - All sectors - Over 10 years (jobs)		374	630	703	740	925	929
On-Site or In-Plant Training - All sectors - None (jobs)		6,623	10,495	11,910	13,259	17,670	17,240
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,646	38,762	43,861	48,661	64,711	62,735
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,612	10,628	12,015	13,103	16,826	16,984
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,773	4,698	5,280	5,706	7,236	7,402
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		360	587	661	720	924	936
Wage income - All (million \$2019)		2,241	3,460	3,952	4,458	5,979	5,957

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	653	615	559	514	480	439	392
Final energy use - Residential (PJ)	311	289	273	257	238	214	188
Final energy use - Commercial (PJ)	190	187	183	179	172	164	155
Final energy use - Industry (PJ)	680	693	708	728	762	777	784

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)		4.04	4.11	5.15	5.33	7.04	7.41

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	19.2	168	317	1,006	1,695	3,221	4,747
Vehicle stocks - LDV – All others (1000 units)	6,205	6,205	6,205	5,886	5,566	4,290	3,013
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	192	404	1,364	4,297	6,258
Public EV charging plugs - DC Fast (1000 units)	0.168		0.662		3.54		9.92
Public EV charging plugs - L2 (1000 units)	0.43		15.9		85.2		238

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 (%)	7.14	13.6	16.9	27.4	49.2	73	86
Sales of space heating units - Electric Resistance (%)	18.1	24.8	24	21.6	16.2	10.6	7.72
Sales of space heating units - Gas (%)	68.7	51.9	49.7	42.9	28.7	12.9	4.2
Sales of space heating units - Fossil (%)	6.08	9.67	9.33	8.18	5.9	3.46	2.13
Sales of water heating units - Electric Heat Pump (%)	0	0.608	2.31	7.59	18.2	29.3	35.3
Sales of water heating units - Electric Resistance (%)	39.3	55.7	55.6	55.8	57.2	59.4	61
Sales of water heating units - Gas Furnace (%)	60.6	43.5	41.9	36.4	24.4	11	3.54
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.204	0.204	0.204	0.204
Sales of cooking units - Electric Resistance (%)	67.5	68.3	71.3	79.1	90.1	96.8	99.1
Sales of cooking units - Gas (%)	32.5	31.7	28.7	20.9	9.94	3.21	0.863
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.71	7.71				

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 (%)	2.05	6.96	10.3	20.9	43.5	68.9	83
Sales of space heating units - Electric Resistance (%)	6.04	3.45	3.62	4.3	5.98	8.09	9.31
Sales of space heating units - Gas Furnace (%)	88.9	86.9	83.6	72.9	49.6	22.7	7.57
Sales of space heating units - Fossil (%)	3.02	2.68	2.47	1.87	0.951	0.308	0.081
Sales of water heating units - Electric Heat Pump (%)	0.622	1.14	3.37	10.3	24.6	40.1	48.5
Sales of water heating units - Electric Resistance (%)	5.71	3.86	5.44	10.7	22.3	35.9	43.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	93.3	94.8	91	78.8	52.9	23.8	7.64
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		19,992	21,841				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	6,680	0	0	0	0	0
Installed thermal - Natural gas (MW)	8,452	8,848	8,101	8,101	6,400	4,663	6,374
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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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)							-1,845
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,936
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-117
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,898

Table 26: E- scenario - PILLAR 6: Land sinks - Agriculture (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,845
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,474
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-234
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-9,552
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,104
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							213
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,124
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,995
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							425
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,228

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		23.7	16.1	9.39	6.45	2.23	0.578
Premature deaths from air pollution - Mobile - On-Road (deaths)		204	190	144	83.2	38.1	15.3
Premature deaths from air pollution - Gas Stations (deaths)		18.9	17.3	13	7.7	3.75	1.78
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.6	28.7	20.2	11.5	5.41	1.88
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.92	1.56	1.08	0.633	0.281	0.106
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.05	4.77	3.82	2.58	1.38	0.607
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.1	24.5	18.9	12.1	6.74	3.27

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.56	2.97	2.32	1.67	1.12	0.704
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.05	1.66	1.29	0.94	0.614
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.79	0.833	0.8	0.759	0.745	0.617
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		76.6	72.5	63.5	45.6	28.4	4.61
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		210	143	83.1	57.1	19.8	5.12
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,813	1,690	1,283	740	339	136
Monetary damages from air pollution - Gas Stations (million \$2019)		167	153	115	68.1	33.2	15.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		298	254	179	102	47.9	16.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17	13.9	9.55	5.61	2.49	0.943
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		44.8	42.2	33.8	22.8	12.3	5.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		240	217	167	107	59.6	28.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		31.5	26.3	20.6	14.8	9.93	6.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		21.7	18.2	14.7	11.4	8.32	5.44
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		24.6	7.35	7.06	6.7	6.57	5.44
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		680	644	564	405	252	40.9

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,024	2,049	1,949	1,900	3,338	2,878
By economic sector - Construction (jobs)		13,384	25,758	28,771	25,771	32,712	65,447
By economic sector - Manufacturing (jobs)		5,545	6,586	8,260	8,281	10,440	13,402
By economic sector - Mining (jobs)		3,992	2,208	1,412	812	412	109
By economic sector - Other (jobs)		1,470	3,968	4,441	3,608	4,956	14,020
By economic sector - Pipeline (jobs)		730	608	426	275	154	66.8
By economic sector - Professional (jobs)		6,961	11,894	14,339	15,604	23,679	41,927

Table 28: E+RE+ scenario - IMPACTS - Jobs (continued)

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		5,758	8,045	9,168	8,861	12,269	25,149
By economic sector - Utilities (jobs)		12,053	15,960	20,666	21,794	27,331	45,568
By resource sector - Biomass (jobs)		4,773	4,689	4,343	5,231	12,484	12,993
By resource sector - CO2 (jobs)		0	0	0	0.001	0.001	0
By resource sector - Coal (jobs)		5,389	1,405	226	191	168	121
By resource sector - Grid (jobs)		14,674	25,479	37,249	39,196	50,861	87,481
By resource sector - Natural Gas (jobs)		7,634	5,912	4,441	4,081	2,730	2,369
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,071	4,833	3,459	2,153	1,093	36.3
By resource sector - Solar (jobs)		8,399	25,112	24,351	15,249	19,688	65,847
By resource sector - Wind (jobs)		4,976	9,646	15,361	20,807	28,267	39,718
By education level - All sectors - High school diploma or less (jobs)		22,888	33,698	38,657	36,762	48,270	86,926
By education level - All sectors - Associates degree or some college (jobs)		15,868	24,175	28,331	27,602	36,252	66,754
By education level - All sectors - Bachelors degree (jobs)		10,276	14,874	17,357	17,361	23,550	41,975
By education level - All sectors - Masters or professional degree (jobs)		2,520	3,752	4,415	4,488	6,211	11,103
By education level - All sectors - Doctoral degree (jobs)		363	577	670	694	1,007	1,807
Related work experience - All sectors - None (jobs)		7,661	11,365	13,144	12,685	16,770	30,448
Related work experience - All sectors - Up to 1 year (jobs)		11,021	16,350	18,733	17,806	23,610	42,591
Related work experience - All sectors - 1 to 4 years (jobs)		18,428	27,220	31,689	31,041	41,355	74,773
Related work experience - All sectors - 4 to 10 years (jobs)		11,750	17,622	20,570	20,177	26,703	48,456
Related work experience - All sectors - Over 10 years (jobs)		3,054	4,519	5,295	5,199	6,853	12,297
On-the-Job Training - All sectors - None (jobs)		2,831	4,271	4,890	4,688	6,271	11,602
On-the-Job Training - All sectors - Up to 1 year (jobs)		34,564	50,352	58,363	56,837	75,899	135,827
On-the-Job Training - All sectors - 1 to 4 years (jobs)		10,589	16,182	18,910	18,395	24,046	44,132
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,455	5,523	6,417	6,187	8,042	15,098
On-the-Job Training - All sectors - Over 10 years (jobs)		476	748	850	799	1,033	1,907
On-Site or In-Plant Training - All sectors - None (jobs)		8,246	12,481	14,446	14,103	18,941	34,329
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		31,409	45,793	53,087	51,589	68,646	123,238
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		8,278	12,570	14,663	14,225	18,610	34,104
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,534	5,542	6,425	6,204	8,073	15,027
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		449	689	809	786	1,021	1,867
Wage income - All (million \$2019)		2,747	4,073	4,795	4,761	6,401	11,633

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	652	610	534	441	358	306	285
Final energy use - Residential (PJ)	311	288	267	232	196	169	152
Final energy use - Commercial (PJ)	190	187	179	166	151	140	135
Final energy use - Industry (PJ)	680	692	706	721	751	767	776

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)		4.81	4.97	8.01	8.51	7.33	7.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV - EV (1000 units)	24.8	531	1,037	2,808	4,580	5,996	7,411
Vehicle stocks - LDV - All others (1000 units)	6,180	5,884	5,589	4,073	2,557	1,447	336
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,189	3,044	4,939	7,479	8,143	7,762
Public EV charging plugs - DC Fast (1000 units)	0.168		2.17		9.57		15.5
Public EV charging plugs - L2 (1000 units)	0.43		52.1		230		372

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 (%)	7.14	16.5	45.4	84.9	91.7	92.1	91.9
Sales of space heating units - Electric Resistance (%)	18.1	24.2	17.6	8.04	6.29	6.24	6.46
Sales of space heating units - Gas (%)	68.7	49.9	30.9	4.83	0.406	0.132	0.133
Sales of space heating units - Fossil (%)	6.08	9.3	6.1	2.21	1.58	1.53	1.49
Sales of water heating units - Electric Heat Pump (%)	0	2.32	17.1	34.9	37.8	38	38.1
Sales of water heating units - Electric Resistance (%)	39.3	55.4	55.8	60.8	61.7	61.8	61.7
Sales of water heating units - Gas Furnace (%)	60.6	42.1	26.8	4.14	0.241	0	0
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.203	0.201	0.202	0.203
Sales of cooking units - Electric Resistance (%)	67.6	74.5	95.6	99.8	100	100	100
Sales of cooking units - Gas (%)	32.4	25.5	4.36	0.22	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.74	7.82				

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 (%)	2.05	9.66	38.6	81.8	89.2	89.7	89.7
Sales of space heating units - Electric Resistance (%)	6.04	3.52	5.22	9.16	9.92	9.96	9.94
Sales of space heating units - Gas Furnace (%)	88.9	84.5	55.7	9.03	0.86	0.359	0.36
Sales of space heating units - Fossil (%)	3.02	2.32	0.438	0.019	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.622	3.21	22.6	47.9	52.2	52.5	52.5
Sales of water heating units - Electric Resistance (%)	5.71	4.94	19	42.9	47.1	47.4	47.4
Sales of water heating units - Gas Furnace (%)	93.3	91.7	58.2	8.97	0.524	0	0
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		19,994	21,829				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	8,572	0	0	0	0	0
Installed thermal - Natural gas (MW)	8,452	8,954	9,535	11,025	11,641	9,904	13,087
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	98.1	147	195	258	334	421	520
Installed renewables - Solar - Base land use assumptions (MW)	128	5,277	21,597	35,586	38,324	43,997	103,295
Installed renewables - Wind - Base land use assumptions (MW)	3,368	3,368	31,037	50,472	51,428	51,428	51,428
Installed renewables - Solar - Constrained land use assumptions (MW)	128	6,637	15,580	22,301	25,214	27,387	105,672
Installed renewables - Wind - Constrained land use assumptions (MW)	3,734	3,734	11,206	11,206	11,206	11,206	57,578
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		6.9	19.5	15.4	2.85	5.57	54.9
Capital invested - Wind - Base (billion \$2018)		0	36.8	24.1	1.13	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)	245	9,523	38,883	63,943	68,733	78,425	184,855
Wind - Base land use assumptions (GWh)	12,511	12,511	100,983	158,008	160,578	160,578	160,578
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	491	23,929	56,058	79,805	89,783	97,144	378,054
Wind - Constrained land use assumptions (GWh)	25,021	25,021	68,916	68,916	68,916	68,916	355,481
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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 tCO ₂ e/y)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-3,947

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8

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 - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426

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 - Total impacted (over 30 years) (1000 hectares)							2,248

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 tCO2e/y)							-1,845
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,936
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-117
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-5,898
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-1,845
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-7,474
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-234
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-9,552
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,104
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							213
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,124
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,995
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							425
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,228

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)		92.9	0.113	0.112	0.098	0.071	0.006

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		21.2	13.3	15.8	11.6	3.99	1.26
Premature deaths from air pollution - Mobile - On-Road (deaths)		204	190	144	83.2	38.1	15.3
Premature deaths from air pollution - Gas Stations (deaths)		18.9	17.3	13	7.7	3.75	1.78
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.6	28.7	20.2	11.5	5.41	1.88
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.92	1.56	1.08	0.633	0.281	0.106
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.05	4.77	3.82	2.58	1.38	0.607
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.1	24.5	18.9	12.1	6.74	3.27
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.56	2.97	2.32	1.67	1.12	0.704
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.05	1.66	1.29	0.94	0.614
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.24	0.83	0.801	0.76	0.748	0.616
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		78.5	75.9	74	61.4	50.7	37.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		188	118	140	103	35.4	11.2
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,813	1,690	1,283	740	339	136
Monetary damages from air pollution - Gas Stations (million \$2019)		167	153	115	68.1	33.2	15.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		298	254	179	102	47.9	16.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17	13.9	9.55	5.61	2.49	0.943
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		44.8	42.2	33.8	22.8	12.3	5.38
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		240	217	167	107	59.6	28.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		31.5	26.3	20.6	14.8	9.93	6.23

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 - Other (million \$2019)		21.7	18.2	14.7	11.4	8.32	5.44
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		19.8	7.33	7.07	6.71	6.6	5.44
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		697	674	657	545	450	331

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,027	2,039	1,944	2,389	4,363	2,858
By economic sector - Construction (jobs)		7,616	10,498	12,365	13,709	17,382	18,218
By economic sector - Manufacturing (jobs)		4,649	4,128	4,183	4,616	6,352	6,127
By economic sector - Mining (jobs)		3,725	2,401	1,804	1,285	977	745
By economic sector - Other (jobs)		453	785	1,435	1,548	1,822	1,801
By economic sector - Pipeline (jobs)		772	1,198	672	595	686	584
By economic sector - Professional (jobs)		4,585	4,722	6,322	8,678	15,872	16,353
By economic sector - Trade (jobs)		4,106	3,726	4,395	4,822	6,836	7,138
By economic sector - Utilities (jobs)		9,147	9,900	12,940	14,002	27,925	42,746
By resource sector - Biomass (jobs)		4,775	4,651	4,338	7,463	17,140	12,208
By resource sector - CO2 (jobs)		27.4	4,397	747	861	2,638	2,506
By resource sector - Coal (jobs)		4,091	921	310	271	244	151
By resource sector - Grid (jobs)		9,505	9,708	15,861	21,182	28,673	32,411
By resource sector - Natural Gas (jobs)		7,721	6,475	6,514	6,351	5,588	4,972
By resource sector - Nuclear (jobs)		0	0	2,762	558	13,237	30,897
By resource sector - Oil (jobs)		6,068	4,885	3,582	2,433	1,683	1,206
By resource sector - Solar (jobs)		803	3,086	6,640	5,678	5,284	4,218
By resource sector - Wind (jobs)		4,089	5,275	5,305	6,848	7,727	8,004
By education level - All sectors - High school diploma or less (jobs)		16,401	17,528	19,349	22,177	30,624	30,193
By education level - All sectors - Associates degree or some college (jobs)		11,081	12,075	13,580	15,836	21,828	22,618
By education level - All sectors - Bachelors degree (jobs)		7,517	7,660	8,578	10,190	15,047	15,433
By education level - All sectors - Masters or professional degree (jobs)		1,828	1,873	2,159	2,621	4,008	4,126
By education level - All sectors - Doctoral degree (jobs)		253	260	315	398	667	682
Related work experience - All sectors - None (jobs)		5,509	5,916	6,550	7,594	10,605	10,609
Related work experience - All sectors - Up to 1 year (jobs)		7,899	8,375	9,355	10,690	15,056	14,814
Related work experience - All sectors - 1 to 4 years (jobs)		13,145	13,852	15,500	18,232	25,861	26,291
Related work experience - All sectors - 4 to 10 years (jobs)		8,332	8,938	9,990	11,697	16,442	16,976
Related work experience - All sectors - Over 10 years (jobs)		2,195	2,316	2,586	3,009	4,211	4,361
On-the-Job Training - All sectors - None (jobs)		2,007	2,114	2,381	2,745	3,913	3,936
On-the-Job Training - All sectors - Up to 1 year (jobs)		25,020	26,081	29,056	33,916	48,423	48,475
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,390	8,127	9,093	10,577	14,467	15,027
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,335	2,708	3,047	3,533	4,765	4,993

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		328	366	404	451	606	622
On-Site or In-Plant Training - All sectors - None (jobs)		5,838	6,230	7,000	8,239	11,867	11,975
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		22,697	23,708	26,411	30,728	43,575	43,744
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,799	6,331	7,080	8,221	11,260	11,624
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,430	2,772	3,093	3,578	4,851	5,063
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		317	356	397	457	622	646
Wage income - All (million \$2019)		1,982	2,117	2,384	2,826	4,048	4,178

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	652	610	534	441	358	306	285
Final energy use - Residential (PJ)	311	288	267	232	196	169	152
Final energy use - Commercial (PJ)	190	187	179	166	151	140	135
Final energy use - Industry (PJ)	680	692	706	721	751	767	776

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)		4.81	4.97	8.01	8.51	7.33	7.63

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	24.8	531	1,037	2,808	4,580	5,996	7,411
Vehicle stocks - LDV – All others (1000 units)	6,180	5,884	5,589	4,073	2,557	1,447	336
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,189	3,044	4,939	7,479	8,143	7,762
Public EV charging plugs - DC Fast (1000 units)	0.168		2.17		9.57		15.5
Public EV charging plugs - L2 (1000 units)	0.43		52.1		230		372

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 (%)	7.14	16.5	45.4	84.9	91.7	92.1	91.9
Sales of space heating units - Electric Resistance (%)	18.1	24.2	17.6	8.04	6.29	6.24	6.46
Sales of space heating units - Gas (%)	68.7	49.9	30.9	4.83	0.406	0.132	0.133
Sales of space heating units - Fossil (%)	6.08	9.3	6.1	2.21	1.58	1.53	1.49
Sales of water heating units - Electric Heat Pump (%)	0	2.32	17.1	34.9	37.8	38	38.1
Sales of water heating units - Electric Resistance (%)	39.3	55.4	55.8	60.8	61.7	61.8	61.7
Sales of water heating units - Gas Furnace (%)	60.6	42.1	26.8	4.14	0.241	0	0
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.203	0.201	0.202	0.203
Sales of cooking units - Electric Resistance (%)	67.6	74.5	95.6	99.8	100	100	100
Sales of cooking units - Gas (%)	32.4	25.5	4.36	0.22	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.74	7.82				

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 (%)	2.05	9.66	38.6	81.8	89.2	89.7	89.7
Sales of space heating units - Electric Resistance (%)	6.04	3.52	5.22	9.16	9.92	9.96	9.94
Sales of space heating units - Gas Furnace (%)	88.9	84.5	55.7	9.03	0.86	0.359	0.36
Sales of space heating units - Fossil (%)	3.02	2.32	0.438	0.019	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.622	3.21	22.6	47.9	52.2	52.5	52.5
Sales of water heating units - Electric Resistance (%)	5.71	4.94	19	42.9	47.1	47.4	47.4
Sales of water heating units - Gas Furnace (%)	93.3	91.7	58.2	8.97	0.524	0	0
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		19,994	21,829				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	4,508	236	236	236	236	0
Installed thermal - Natural gas (MW)	8,452	6,799	6,148	10,723	12,408	12,594	12,092
Installed thermal - Nuclear (MW)	0	0	0	1,160	1,160	6,660	18,894
Installed renewables - Rooftop PV (MW)	98.1	147	195	258	334	421	520
Installed renewables - Solar - Base land use assumptions (MW)	128	128	2,241	7,093	10,994	13,886	14,376
Installed renewables - Wind - Base land use assumptions (MW)	3,368	4,017	11,659	11,659	13,251	13,826	14,585
Installed renewables - Solar - Constrained land use assumptions (MW)	128	128	2,830	7,676	11,022	15,676	15,762
Installed renewables - Wind - Constrained land use assumptions (MW)	3,368	3,368	5,233	5,233	6,705	7,018	7,390
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	2.53	5.35	4.05	2.84	0.454
Capital invested - Wind - Base (billion \$2018)		0.955	10.4	0	2.02	0.645	0.849
Capital invested - Solar PV - Constrained (billion \$2018)		0	3.23	5.34	3.48	4.56	0.08
Capital invested - Wind - Constrained (billion \$2018)		0	2.48	0	1.74	0.35	0.394

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	245	245	4,015	12,746	19,768	24,951	25,821
Wind - Base land use assumptions (GWh)	12,511	14,691	40,509	40,509	46,016	47,863	50,422
Offshore Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Constrained land use assumptions (GWh)	245	245	5,081	13,773	19,781	28,134	28,289
Wind - Constrained land use assumptions (GWh)	12,511	12,511	18,200	18,200	22,602	23,538	24,627
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,834

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136

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)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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)							-1,845
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-3,936
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-117
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-5,898
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-1,845
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-7,474
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-234
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-9,552

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)							808
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,104
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							213
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,124
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							808
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,995
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							425
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,228

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)		92.9	0.113	0.112	0.098	0.071	0.006
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		25.1	14.4	8.31	5.84	3.01	0.985
Premature deaths from air pollution - Mobile - On-Road (deaths)		207	209	203	183	145	99.7
Premature deaths from air pollution - Gas Stations (deaths)		19.3	19.4	18.6	16.6	13.2	9.1
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		33.7	30.6	27.2	22.9	17.5	11.7
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.95	1.87	1.77	1.54	1.17	0.78
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		5.09	5.17	5.17	4.82	3.91	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.06	7.7	7.3	6.88	6.45	6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.2	26.4	25.2	22.6	18.5	13.7
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.57	3.3	3.03	2.63	2.14	1.68
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.46	2.2	1.95	1.71	1.47	1.25
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.5	0.836	0.817	0.789	0.773	0.739

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)		77.5	71.1	63	55.8	49.7	34.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		823	1	0.992	0.867	0.63	0.056
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		222	127	73.6	51.7	26.7	8.73
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,843	1,859	1,807	1,625	1,292	887
Monetary damages from air pollution - Gas Stations (million \$2019)		171	172	165	147	117	80.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		299	271	241	203	155	104
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		17.3	16.5	15.7	13.7	10.3	6.91
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		45.1	45.8	45.8	42.7	34.6	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		71.3	68.2	64.6	60.9	57.1	53.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		241	234	223	200	164	121
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		31.6	29.2	26.8	23.2	19	14.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		21.7	19.5	17.3	15.1	13	11.1
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		22	7.38	7.21	6.96	6.82	6.52
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		688	632	559	496	441	305

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,027	2,037	3,841	5,010	6,837	5,949
By economic sector - Construction (jobs)		8,977	20,980	23,136	21,810	24,461	27,167
By economic sector - Manufacturing (jobs)		5,225	5,849	6,973	7,638	9,926	10,469
By economic sector - Mining (jobs)		3,877	2,362	1,831	1,449	1,107	729
By economic sector - Other (jobs)		650	2,776	3,443	2,944	2,991	3,685
By economic sector - Pipeline (jobs)		745	1,090	564	497	583	467
By economic sector - Professional (jobs)		5,330	9,397	13,530	17,410	24,480	25,552
By economic sector - Trade (jobs)		4,637	6,566	8,074	8,804	10,807	11,661
By economic sector - Utilities (jobs)		10,382	14,382	16,401	18,793	23,209	25,319
By resource sector - Biomass (jobs)		4,785	4,651	10,760	19,081	31,573	28,384
By resource sector - CO2 (jobs)		27.1	3,976	666	811	2,425	2,247
By resource sector - Coal (jobs)		4,770	1,155	232	199	175	151
By resource sector - Grid (jobs)		11,522	19,086	28,204	32,484	40,666	45,974
By resource sector - Natural Gas (jobs)		7,781	5,640	4,451	4,609	3,433	2,393
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,133	5,208	4,437	3,768	2,847	1,734

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		2,016	16,623	18,339	12,256	9,549	11,780
By resource sector - Wind (jobs)		4,817	9,101	10,706	11,148	13,731	18,335
By education level - All sectors - High school diploma or less (jobs)		18,441	28,700	34,154	36,434	44,500	46,881
By education level - All sectors - Associates degree or some college (jobs)		12,616	20,483	23,813	25,364	30,950	33,505
By education level - All sectors - Bachelors degree (jobs)		8,449	12,633	15,275	17,263	22,038	23,315
By education level - All sectors - Masters or professional degree (jobs)		2,058	3,152	3,931	4,544	5,898	6,239
By education level - All sectors - Doctoral degree (jobs)		287	471	621	751	1,014	1,059
Related work experience - All sectors - None (jobs)		6,194	9,695	11,518	12,455	15,346	16,249
Related work experience - All sectors - Up to 1 year (jobs)		8,874	13,827	16,701	17,997	22,274	23,408
Related work experience - All sectors - 1 to 4 years (jobs)		14,864	23,095	27,524	30,019	37,236	39,633
Related work experience - All sectors - 4 to 10 years (jobs)		9,438	14,978	17,548	19,008	23,504	25,218
Related work experience - All sectors - Over 10 years (jobs)		2,480	3,844	4,503	4,877	6,041	6,491
On-the-Job Training - All sectors - None (jobs)		2,262	3,587	4,288	4,660	5,807	6,144
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,145	42,790	51,614	56,663	70,777	74,663
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,403	13,748	15,861	16,775	20,332	22,032
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,668	4,682	5,316	5,529	6,611	7,218
On-the-Job Training - All sectors - Over 10 years (jobs)		373	632	714	729	871	941
On-Site or In-Plant Training - All sectors - None (jobs)		6,601	10,535	12,653	13,834	17,265	18,306
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,544	38,923	46,721	51,062	63,566	67,200
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,585	10,674	12,376	13,113	15,917	17,186
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,762	4,718	5,366	5,627	6,774	7,355
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		359	589	678	721	878	951
Wage income - All (million \$2019)		2,232	3,475	4,175	4,622	5,815	6,263

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	653	615	559	514	480	439	392
Final energy use - Residential (PJ)	311	289	273	257	238	214	188
Final energy use - Commercial (PJ)	190	187	183	179	172	164	155
Final energy use - Industry (PJ)	680	693	708	728	762	777	784

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)		4.04	4.11	5.15	5.33	7.04	7.41

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	19.2	168	317	1,006	1,695	3,221	4,747
Vehicle stocks - LDV – All others (1000 units)	6,205	6,205	6,205	5,886	5,566	4,290	3,013
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	192	404	1,364	4,297	6,258
Public EV charging plugs - DC Fast (1000 units)	0.168		0.662		3.54		9.92
Public EV charging plugs - L2 (1000 units)	0.43		15.9		85.2		238

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 (%)	7.14	13.6	16.9	27.4	49.2	73	86
Sales of space heating units - Electric Resistance (%)	18.1	24.8	24	21.6	16.2	10.6	7.72
Sales of space heating units - Gas (%)	68.7	51.9	49.7	42.9	28.7	12.9	4.2
Sales of space heating units - Fossil (%)	6.08	9.67	9.33	8.18	5.9	3.46	2.13
Sales of water heating units - Electric Heat Pump (%)	0	0.608	2.31	7.59	18.2	29.3	35.3
Sales of water heating units - Electric Resistance (%)	39.3	55.7	55.6	55.8	57.2	59.4	61
Sales of water heating units - Gas Furnace (%)	60.6	43.5	41.9	36.4	24.4	11	3.54
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.204	0.204	0.204	0.204
Sales of cooking units - Electric Resistance (%)	67.5	68.3	71.3	79.1	90.1	96.8	99.1
Sales of cooking units - Gas (%)	32.5	31.7	28.7	20.9	9.94	3.21	0.863
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.71	7.71				

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 (%)	2.05	6.96	10.3	20.9	43.5	68.9	83
Sales of space heating units - Electric Resistance (%)	6.04	3.45	3.62	4.3	5.98	8.09	9.31
Sales of space heating units - Gas Furnace (%)	88.9	86.9	83.6	72.9	49.6	22.7	7.57
Sales of space heating units - Fossil (%)	3.02	2.68	2.47	1.87	0.951	0.308	0.081
Sales of water heating units - Electric Heat Pump (%)	0.622	1.14	3.37	10.3	24.6	40.1	48.5
Sales of water heating units - Electric Resistance (%)	5.71	3.86	5.44	10.7	22.3	35.9	43.7
Sales of water heating units - Gas Furnace (%)	93.3	94.8	91	78.8	52.9	23.8	7.64
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		19,992	21,841				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	7,348	0	0	0	0	0
Installed thermal - Natural gas (MW)	8,452	8,954	8,627	8,627	9,016	7,279	7,276
Installed thermal - Nuclear (MW)	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 power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0.009	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0.001	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	0.958	0.958	0.958
Biomass w/ccu allam power plant (GWh)	0	0	0	0	9.16	9.16	9.16

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	1	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	19	52	105	105
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	16,160	28,771	45,905	0
Biomass purchases (million \$2018/y)		0	0	1,634	4,541	9,183	9,183

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	20.8	57.7	120	120
Annual - BECCS (MMT)		0	0	20.8	57.7	117	117
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	0	0	3.42	3.53
Cumulative - All (MMT)		0	0	20.8	78.5	199	319
Cumulative - BECCS (MMT)		0	0	20.8	78.5	195	312
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	0	0	3.42	6.95

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	465	467	471	471	471
Spur (km)		0	34.3	51.8	1,171	3,524	4,188
All (km)		0	499	518	1,642	3,995	4,659
Cumulative investment - Trunk (million \$2018)		0	2,358	2,372	2,502	2,726	2,726
Cumulative investment - Spur (million \$2018)		0	130	265	1,323	4,317	4,777
Cumulative investment - All (million \$2018)		0	2,487	2,637	3,825	7,043	7,503

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.85	7.49	14.3	19.7	20.1
Injection wells (wells)		0	3	13	23	39	49
Resource characterization, appraisal, permitting costs (million \$2020)		50.6	222	344	344	344	344
Wells and facilities construction costs (million \$2020)		0	101	394	701	1,173	1,456

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)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-168

Table 62: E-B+ 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)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136

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)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,248

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)							-2,302
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-3,578
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-105
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)							-5,986
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-2,302
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-6,796

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)							-211
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)							-9,309
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,204
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,906
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							192
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							400
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							67.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							3,769
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,204
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							8,939
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							383
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							400
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							67.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,994

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)		301	199	154	131	123	120
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.8	26.3	32.3	34.5	29.9	26.5
Premature deaths from air pollution - Mobile - On-Road (deaths)		207	212	217	222	228	234
Premature deaths from air pollution - Gas Stations (deaths)		19.2	19.5	19.8	20.2	20.5	20.7

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)		33.4	30.5	28	26.3	25.2	24.3
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.9	1.62	1.18	0.77	0.448	0.272
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		4.89	4.91	5	5.08	5.02	4.9
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		8.42	8.42	8.38	8.31	8.22	8.09
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		27.4	26.7	24.2	21.2	19.3	18.8
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		3.7	3.7	3.57	3.35	3.16	3.06
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		2.57	2.61	2.65	2.69	2.72	2.76
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		5.67	3.82	3	2.78	2.63	2.41
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		77.9	80.9	81.9	78	76.6	70.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		2,670	1,765	1,362	1,161	1,091	1,065
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		202	233	287	306	265	235
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,842	1,885	1,926	1,975	2,025	2,076
Monetary damages from air pollution - Gas Stations (million \$2019)		170	173	175	178	181	184
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		296	270	248	233	224	216
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		16.9	14.4	10.5	6.82	3.97	2.41
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		43.3	43.5	44.3	45	44.5	43.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		74.6	74.6	74.2	73.5	72.7	71.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		242	236	215	188	171	166
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		32.7	32.7	31.6	29.6	27.9	27.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		22.7	23.1	23.5	23.8	24.1	24.4
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		50	33.7	26.5	24.5	23.2	21.2

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)		692	719	727	693	680	625

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,026	2,023	2,023	2,019	2,019	2,020
By economic sector - Construction (jobs)		7,885	8,044	8,270	10,279	9,937	9,539
By economic sector - Manufacturing (jobs)		4,263	4,169	4,181	4,718	4,394	4,084
By economic sector - Mining (jobs)		4,970	3,575	2,832	2,293	1,908	1,419
By economic sector - Other (jobs)		431	469	496	684	679	742
By economic sector - Pipeline (jobs)		769	806	820	772	781	774
By economic sector - Professional (jobs)		4,941	4,555	4,394	5,469	5,264	4,973
By economic sector - Trade (jobs)		4,945	4,129	3,797	4,176	3,943	3,574
By economic sector - Utilities (jobs)		11,389	10,397	10,468	13,457	12,431	10,736
By resource sector - Biomass (jobs)		4,778	4,642	4,519	4,405	4,312	4,227
By resource sector - CO2 (jobs)		0	0.04	0.051	0.054	0.06	0.064
By resource sector - Coal (jobs)		7,526	4,897	3,767	3,462	3,111	1,468
By resource sector - Grid (jobs)		13,102	12,194	12,569	17,520	16,135	14,237
By resource sector - Natural Gas (jobs)		7,983	7,833	8,180	9,080	8,407	7,742
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		6,185	5,340	4,740	4,397	4,185	4,006
By resource sector - Solar (jobs)			497	633	655	688	1,216
By resource sector - Wind (jobs)		2,045	2,765	2,872	4,349	4,520	4,964
By education level - All sectors - High school diploma or less (jobs)		18,530	17,013	16,649	19,342	18,284	16,813
By education level - All sectors - Associates degree or some college (jobs)		12,478	11,502	11,311	13,567	12,771	11,652
By education level - All sectors - Bachelors degree (jobs)		8,325	7,563	7,302	8,566	8,042	7,318
By education level - All sectors - Masters or professional degree (jobs)		2,016	1,842	1,781	2,112	1,991	1,825
By education level - All sectors - Doctoral degree (jobs)		270	248	238	282	269	251
Related work experience - All sectors - None (jobs)		6,155	5,685	5,577	6,555	6,190	5,683
Related work experience - All sectors - Up to 1 year (jobs)		8,823	8,120	7,933	9,173	8,692	8,039
Related work experience - All sectors - 1 to 4 years (jobs)		14,887	13,554	13,196	15,561	14,639	13,340
Related work experience - All sectors - 4 to 10 years (jobs)		9,319	8,569	8,384	9,982	9,395	8,570
Related work experience - All sectors - Over 10 years (jobs)		2,434	2,240	2,190	2,597	2,441	2,228
On-the-Job Training - All sectors - None (jobs)		2,214	2,030	1,969	2,290	2,160	1,987
On-the-Job Training - All sectors - Up to 1 year (jobs)		28,116	25,659	24,971	29,128	27,456	25,131
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,312	7,684	7,564	9,082	8,553	7,811
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,628	2,466	2,452	2,986	2,827	2,595
On-the-Job Training - All sectors - Over 10 years (jobs)		348	329	324	381	361	335
On-Site or In-Plant Training - All sectors - None (jobs)		6,429	5,930	5,790	6,827	6,438	5,913
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		25,580	23,331	22,711	26,513	24,987	22,861

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)		6,534	6,026	5,923	7,077	6,666	6,089
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,723	2,548	2,525	3,052	2,887	2,649
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		352	332	331	399	378	348
Wage income - All (million \$2019)		2,232	2,067	2,042	2,438	2,327	2,153

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	653	615	563	533	532	548	569
Final energy use - Residential (PJ)	311	289	277	269	264	262	259
Final energy use - Commercial (PJ)	190	190	188	184	179	179	183
Final energy use - Industry (PJ)	681	703	718	717	727	733	738

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)		4.26	4.35	4.69	4.81	5.72	5.94

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 (%)	5.73	19.2	19.7	20.7	21.5	22.5	23.7
Sales of space heating units - Electric Resistance (%)	18.5	23.4	23.1	22.7	21.9	20.9	19.8
Sales of space heating units - Gas (%)	69.5	49	48.9	48.6	48.6	48.6	48.5
Sales of space heating units - Fossil (%)	6.24	8.46	8.19	7.99	8.01	8.01	8.02
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	39.3	55.6	55.5	55.3	55.3	55.2	55.1
Sales of water heating units - Gas Furnace (%)	60.6	44.2	44.3	44.5	44.5	44.6	44.7
Sales of water heating units - Other (%)	0.101	0.202	0.203	0.204	0.204	0.205	0.206
Sales of cooking units - Electric Resistance (%)	67.2	67.2	67.2	67.2	67.2	67.2	67.2
Sales of cooking units - Gas (%)	32.8	32.8	32.8	32.8	32.8	32.8	32.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		5.46	5.93				

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 (%)	2.05	13.1	45	71.1	75.4	75.9	75.9
Sales of space heating units - Electric Resistance (%)	6.04	4.34	8.93	17.2	22.8	23.7	23.7
Sales of space heating units - Gas Furnace (%)	88.9	80.1	44.8	11.5	1.77	0.439	0.36
Sales of space heating units - Fossil (%)	3.02	2.48	1.25	0.221	0.025	0.001	0
Sales of water heating units - Electric Heat Pump (%)	0.622	0.346	0.35	0.35	0.344	0.346	0.347
Sales of water heating units - Electric Resistance (%)	5.71	3.27	3.23	3.24	3.22	3.2	3.2
Sales of water heating units - Gas Furnace (%)	93.3	96.2	96.2	96.2	96.3	96.3	96.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	0.34	0.189	0.189	0.191	0.19	0.19	0.19
Sales of cooking units - Electric Resistance (%)	41	44.2	44.3	44.3	44.3	44.4	44.5
Sales of cooking units - Gas (%)	59	55.8	55.7	55.7	55.7	55.6	55.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		19,774	20,475				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	14,827	11,985	7,904	7,904	7,904	7,348	0
Installed thermal - Natural gas (MW)	8,452	9,589	8,842	11,474	16,572	15,873	16,694
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	98.1	147	195	258	334	421	520
Installed renewables - Solar - Base land use assumptions (MW)	128	128	128	128	128	128	128
Installed renewables - Wind - Base land use assumptions (MW)	3,368	3,368	7,216	7,910	13,607	14,106	14,768

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	245	245	245	245	245	245	245
Wind - Base land use assumptions (GWh)	12,511	12,511	25,343	27,647	47,158	48,758	51,005
OffshoreWind - 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 CO2e/y)	-6.5		-4.24				-3.79
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.499		-0.898				-0.933
Business-as-usual carbon sink - Total (Mt CO2e/y)	-7		-5.14				-4.73

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-38.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-325
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-829
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-85.6
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-611
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-702
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-632
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-290
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-433
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-3,947

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-58.2
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-1,138
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-1,493
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-125
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-1,223
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-1,354
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-948
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-2,056
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-858
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-9,255
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-77.5
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-1,952
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-2,158
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-168
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-1,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-2,006
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-1,264
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-3,822
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-14,566
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-1,284
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							6.34
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							248
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							422
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							31
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)							100
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							41.8

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 - Reforest pasture (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							258
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,125
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							9.51
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							256
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							761
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							46.6
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)							145
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							62.7
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							136
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							519
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,936
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							12.7
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							264
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,100
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							62
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)							191
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							83.6
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							109
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							426

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 - Total impacted (over 30 years) (1000 hectares)							2,248