



Net-Zero America - Colorado data

October 29, 2021 (updated November 17, 2023)

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		31.4	25.4	21.3	20.8	12.6	2.99
Premature deaths from air pollution - Mobile - On-Road (deaths)		103	101	80.7	48.7	22.8	8.74
Premature deaths from air pollution - Gas Stations (deaths)		10.8	10.5	8.3	5.07	2.45	1.05
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		23.1	22.4	17.7	11	5.68	2.33
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.086	0.076	0.059	0.04	0.025	0.015
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.34	2.41	2.09	1.5	0.868	0.412
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.278	0.277	0.274	0.269	0.262	0.252
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.91	8.55	6.99	4.7	2.67	1.29
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.47	1.25	1.03	0.817	0.607	0.406
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.84	1.65	1.42	1.17	0.898	0.618
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.56	0.198	0.187	0.169	0.158	0.156
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		164	157	142	115	84.3	52
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		220	0.264	0.262	0.199	0.123	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		278	225	189	184	111	26.5
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		914	899	717	433	203	77.7
Monetary damages from air pollution - Gas Stations (million \$2019)		95.6	92.9	73.5	44.9	21.7	9.26
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		205	199	157	97.5	50.3	20.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.758	0.672	0.519	0.355	0.223	0.135
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		20.8	21.3	18.5	13.3	7.69	3.65
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.46	2.45	2.42	2.38	2.32	2.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		78.9	75.7	61.8	41.6	23.7	11.4

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)		13	11	9.15	7.24	5.38	3.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		16.3	14.6	12.6	10.3	7.95	5.47
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		13.8	1.74	1.65	1.49	1.4	1.37
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,456	1,392	1,263	1,020	748	462

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		227	238	217	158	255	317
By economic sector - Construction (jobs)		12,783	15,394	19,794	23,573	26,720	30,453
By economic sector - Manufacturing (jobs)		12,053	15,027	16,510	14,853	13,060	13,106
By economic sector - Mining (jobs)		14,440	11,148	8,609	5,627	3,632	2,001
By economic sector - Other (jobs)		1,024	1,328	2,112	2,858	3,589	4,855
By economic sector - Pipeline (jobs)		1,289	1,273	1,048	827	631	478
By economic sector - Professional (jobs)		7,846	9,421	12,268	15,025	17,776	21,254
By economic sector - Trade (jobs)		7,811	7,953	9,095	9,937	11,080	12,974
By economic sector - Utilities (jobs)		8,322	10,350	13,634	17,804	21,227	23,467
By resource sector - Biomass (jobs)		553	552	488	399	940	1,388
By resource sector - CO2 (jobs)		18.7	861	190	326	524	982
By resource sector - Coal (jobs)		1,735	395	82.3	68.3	59.3	51.9
By resource sector - Grid (jobs)		9,068	13,062	21,222	29,120	36,814	41,533
By resource sector - Natural Gas (jobs)		14,315	12,133	9,627	8,311	5,968	4,078
By resource sector - Nuclear (jobs)		0	0.003	0.007	0.008	0.018	0.03
By resource sector - Oil (jobs)		25,199	22,582	20,059	14,539	10,815	6,718
By resource sector - Solar (jobs)		6,872	7,260	11,310	13,097	14,762	20,443
By resource sector - Wind (jobs)		8,035	15,287	20,310	24,802	28,086	33,709
By education level - All sectors - High school diploma or less (jobs)		26,905	29,646	34,359	37,256	40,104	44,361
By education level - All sectors - Associates degree or some college (jobs)		19,463	21,799	25,625	28,473	31,087	34,851
By education level - All sectors - Bachelors degree (jobs)		15,269	16,247	18,229	19,381	20,698	22,851
By education level - All sectors - Masters or professional degree (jobs)		3,631	3,873	4,416	4,816	5,259	5,902
By education level - All sectors - Doctoral degree (jobs)		527	567	660	736	819	940
Related work experience - All sectors - None (jobs)		9,189	10,134	11,767	12,903	14,012	15,614
Related work experience - All sectors - Up to 1 year (jobs)		12,650	14,007	16,342	17,790	19,241	21,521
Related work experience - All sectors - 1 to 4 years (jobs)		24,259	26,398	30,322	32,901	35,502	39,355
Related work experience - All sectors - 4 to 10 years (jobs)		15,423	16,927	19,541	21,370	23,136	25,718
Related work experience - All sectors - Over 10 years (jobs)		4,275	4,667	5,317	5,698	6,077	6,697
On-the-Job Training - All sectors - None (jobs)		3,701	3,986	4,558	4,917	5,300	5,928
On-the-Job Training - All sectors - Up to 1 year (jobs)		44,361	48,388	55,505	59,803	64,254	71,217

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)		13,265	14,723	17,197	19,049	20,753	23,129
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,818	4,313	5,200	6,015	6,736	7,609
On-the-Job Training - All sectors - Over 10 years (jobs)		650	723	827	879	925	1,021
On-Site or In-Plant Training - All sectors - None (jobs)		10,643	11,706	13,531	14,743	15,952	17,856
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		40,142	43,760	50,226	54,183	58,254	64,549
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		10,396	11,508	13,406	14,771	16,045	17,847
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,118	4,587	5,439	6,184	6,854	7,684
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		497	572	686	780	863	970
Wage income - All (million \$2019)		4,060	4,437	5,123	5,614	6,128	6,853

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

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

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

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

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)		2.81	2.93	5.73	6.16	6.1	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	111	542	974	2,485	3,997	5,204	6,412
Vehicle stocks - LDV – All others (1000 units)	5,347	5,091	4,835	3,524	2,212	1,251	291
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,014	2,644	4,211	6,408	6,943	6,637
Public EV charging plugs - DC Fast (1000 units)	0.303		1.77		7.25		11.6
Public EV charging plugs - L2 (1000 units)	2.12		42.5		174		280

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 (%)	5.62	14.5	37.2	82.6	92	92.7	92.7
Sales of space heating units - Electric Resistance (%)	7.65	13.8	11	4.91	3.67	3.58	3.63
Sales of space heating units - Gas (%)	83.5	66	47.3	10.4	2.8	2.21	2.19
Sales of space heating units - Fossil (%)	3.24	5.67	4.53	2.12	1.56	1.5	1.52
Sales of water heating units - Electric Heat Pump (%)	0	0.93	12.1	36.4	41.4	41.7	41.8
Sales of water heating units - Electric Resistance (%)	13.2	25.9	34.2	52.7	56.7	57	57
Sales of water heating units - Gas Furnace (%)	85.7	72	52.4	9.64	0.728	0.02	0
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.21	1.21	1.21
Sales of cooking units - Electric Resistance (%)	50.5	61	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.5	39	6.67	0.336	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		4.42	4.7				

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 (%)	2.64	8.18	30.6	79.8	90	90.8	90.8
Sales of space heating units - Electric Resistance (%)	2.48	3.49	4.92	8.08	8.66	8.7	8.7
Sales of space heating units - Gas (%)	94.9	88.1	64.4	12.2	1.37	0.522	0.498
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.022	1.12	14.3	42.9	48.9	49.4	49.4
Sales of water heating units - Electric Resistance (%)	1.1	2.5	15.4	43.8	49.7	50.2	50.2
Sales of water heating units - Gas (%)	98.6	96	69.9	12.9	0.972	0.027	0
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		14,374	15,990				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,905	2,238	0	0	0	0	0
Installed thermal - Natural gas (MW)	5,482	5,261	7,803	8,430	11,112	12,889	13,606
Installed thermal - Nuclear (MW)	0	0	0.001	0.004	0.007	0.013	0.024
Installed renewables - Rooftop PV (MW)	895	1,362	1,825	2,410	3,134	4,018	5,120
Installed renewables - Solar - Base land use assumptions (MW)	454	954	1,492	3,798	6,651	10,148	12,829
Installed renewables - Wind - Base land use assumptions (MW)	4,381	4,886	6,317	6,818	8,895	11,556	12,854
Installed renewables - Solar - Constrained land use assumptions (MW)	437	437	1,484	4,289	8,277	9,660	12,254
Installed renewables - Wind - Constrained land use assumptions (MW)	4,732	4,905	5,667	7,069	12,061	17,295	20,797
Capital invested - Solar PV - Base (billion \$2018)		0.669	0.644	2.54	2.97	3.43	2.48
Capital invested - Wind - Base (billion \$2018)		0.226	1.91	0.621	2.45	2.98	1.38

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion \$2018)		1.95	1.04	2.19	2.61	2.02	0.721
Capital invested - Wind - Constrained (billion \$2018)		1.32	2.22	2.91	6.72	6.61	3.73
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0.01	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0.041	0.399

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,142	2,233	3,442	8,566	14,947	22,796	28,849
Wind - Base land use assumptions (GWh)	16,760	17,332	22,431	24,110	31,262	40,168	44,490
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	856	856	3,149	9,300	18,183	21,314	27,135
Wind - Constrained land use assumptions (GWh)	16,760	17,346	19,845	24,217	39,633	55,075	64,986
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	46.2	494
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	9.89	9.89

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	2	3
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	1	3	5
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	1	1
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	0	330	2,342	2,221
Biomass purchases (million \$2018/y)		0	0	0	23.6	190	345

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

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

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

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

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

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

Table 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)							-812
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-4,092
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-34,021
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-1,620
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-3,239
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-48,148
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-6,121
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205

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 - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7,44
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083

Table 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)							-173
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,384

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-107
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-1,664
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-173
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-2,661
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-3,048
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,071
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							164
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,407
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,977
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							329
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,478

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)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		31.1	22.4	19.1	13.7	6.58	1.91
Premature deaths from air pollution - Mobile - On-Road (deaths)		104	111	113	106	88	62.5
Premature deaths from air pollution - Gas Stations (deaths)		11	11.7	11.8	11.1	9.14	6.5
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		23.2	23.6	23.5	22.1	18.7	13.6
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.088	0.087	0.083	0.076	0.065	0.054
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.36	2.57	2.76	2.77	2.41	1.84

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.278	0.277	0.274	0.269	0.262	0.252
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.93	9.18	9.25	8.79	7.62	5.92
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.47	1.34	1.22	1.09	0.964	0.834
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.84	1.77	1.67	1.54	1.41	1.26
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.47	0.201	0.201	0.193	0.161	0.104
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		163	148	125	106	92.6	69
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		220	0.264	0.262	0.199	0.123	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		275	198	169	121	58.3	16.9
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		929	987	1,006	945	783	556
Monetary damages from air pollution - Gas Stations (million \$2019)		97.5	104	105	98	80.9	57.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		205	209	208	196	165	120
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.78	0.774	0.74	0.67	0.578	0.477
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		20.9	22.7	24.5	24.6	21.3	16.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.46	2.45	2.42	2.38	2.32	2.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		79	81.3	81.9	77.8	67.4	52.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13	11.9	10.8	9.69	8.53	7.39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		16.3	15.6	14.8	13.7	12.5	11.1
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		13	1.78	1.77	1.7	1.42	0.919
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,451	1,317	1,108	942	822	613

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		230	233	215	187	349	317
By economic sector - Construction (jobs)		12,819	15,567	18,270	21,963	28,732	35,158

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		12,221	15,259	15,013	14,735	16,347	16,160
By economic sector - Mining (jobs)		14,426	10,980	8,406	6,429	4,917	2,913
By economic sector - Other (jobs)		1,032	1,341	1,953	2,645	3,775	5,308
By economic sector - Pipeline (jobs)		1,289	1,312	1,017	925	855	721
By economic sector - Professional (jobs)		7,882	9,445	11,528	14,396	19,509	24,920
By economic sector - Trade (jobs)		7,831	7,978	8,741	9,943	12,468	15,301
By economic sector - Utilities (jobs)		8,210	10,193	11,568	14,733	21,478	27,002
By resource sector - Biomass (jobs)		556	538	486	575	1,484	1,342
By resource sector - CO2 (jobs)		18.8	1,462	328	569	899	1,671
By resource sector - Coal (jobs)		1,711	396	84.9	72.3	59.7	45.7
By resource sector - Grid (jobs)		8,811	12,607	17,711	23,918	37,443	46,972
By resource sector - Natural Gas (jobs)		14,280	11,158	7,968	6,359	5,209	4,960
By resource sector - Nuclear (jobs)		0	0.004	0.008	0.009	0.022	0.035
By resource sector - Oil (jobs)		25,245	22,812	20,662	18,316	15,928	10,168
By resource sector - Solar (jobs)		7,003	7,415	10,132	12,025	15,676	20,618
By resource sector - Wind (jobs)		8,314	15,922	19,340	24,120	31,732	42,024
By education level - All sectors - High school diploma or less (jobs)		26,964	29,749	31,596	35,276	44,430	51,942
By education level - All sectors - Associates degree or some college (jobs)		19,503	21,857	23,447	26,660	34,087	40,777
By education level - All sectors - Bachelors degree (jobs)		15,306	16,264	16,941	18,683	23,163	27,017
By education level - All sectors - Masters or professional degree (jobs)		3,638	3,871	4,106	4,621	5,837	6,955
By education level - All sectors - Doctoral degree (jobs)		529	567	621	716	912	1,108
Related work experience - All sectors - None (jobs)		9,206	10,158	10,812	12,176	15,452	18,281
Related work experience - All sectors - Up to 1 year (jobs)		12,687	14,067	15,052	16,872	21,339	25,161
Related work experience - All sectors - 1 to 4 years (jobs)		24,306	26,446	27,967	31,274	39,342	46,250
Related work experience - All sectors - 4 to 10 years (jobs)		15,455	16,961	17,988	20,220	25,540	30,218
Related work experience - All sectors - Over 10 years (jobs)		4,286	4,676	4,892	5,414	6,757	7,891
On-the-Job Training - All sectors - None (jobs)		3,712	3,998	4,227	4,708	5,894	6,949
On-the-Job Training - All sectors - Up to 1 year (jobs)		44,468	48,508	51,214	56,985	71,496	83,696
On-the-Job Training - All sectors - 1 to 4 years (jobs)		13,288	14,755	15,756	17,859	22,746	27,091
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,820	4,320	4,751	5,564	7,260	8,862
On-the-Job Training - All sectors - Over 10 years (jobs)		653	728	763	840	1,034	1,202
On-Site or In-Plant Training - All sectors - None (jobs)		10,674	11,745	12,482	14,007	17,676	20,944
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		40,233	43,863	46,322	51,575	64,749	75,834
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		10,415	11,535	12,296	13,887	17,632	20,911
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,120	4,593	4,986	5,764	7,435	8,978
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		498	573	625	723	938	1,133
Wage income - All (million \$2019)		4,066	4,439	4,725	5,334	6,784	8,064

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

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

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)		2.32	2.38	3.28	3.43	5.13	5.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	85.6	212	339	925	1,511	2,809	4,107
Vehicle stocks - LDV – All others (1000 units)	5,368	5,368	5,368	5,092	4,816	3,711	2,606
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	172	344	1,178	3,652	5,339
Public EV charging plugs - DC Fast (1000 units)	0.303		0.614		2.74		7.45
Public EV charging plugs - L2 (1000 units)	2.12		14.8		65.9		179

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 (%)	5.62	13.3	15.8	24.3	44	68.4	82.7
Sales of space heating units - Electric Resistance (%)	7.65	13.9	13.5	12.5	10.1	6.84	4.95
Sales of space heating units - Gas (%)	83.5	67.1	65	58.1	42	22.1	10.3
Sales of space heating units - Fossil (%)	3.24	5.74	5.68	5.1	3.9	2.66	2.01
Sales of water heating units - Electric Heat Pump (%)	0	0.46	1.74	5.96	16.1	28.9	36.5
Sales of water heating units - Electric Resistance (%)	13.2	25.6	26.5	29.7	37.4	47.1	52.9
Sales of water heating units - Gas Furnace (%)	85.7	72.7	70.5	63.1	45.3	22.7	9.32
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.22	1.22	1.21
Sales of cooking units - Electric Resistance (%)	50.3	51.6	56.1	68.1	84.8	95.1	98.7
Sales of cooking units - Gas (%)	49.7	48.4	43.9	31.9	15.2	4.9	1.32
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		4.41	4.7				

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	41.9	46.2	50.2	60.8	75.4	84.6	87.8
Sales of cooking units - Gas (%)	58.1	53.8	49.8	39.2	24.6	15.4	12.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		14,373	15,986				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,905	2,238	0	0	0	0	0
Installed thermal - Natural gas (MW)	5,482	5,273	6,919	6,498	5,438	6,649	13,230
Installed thermal - Nuclear (MW)	0	0	0.002	0.005	0.007	0.015	0.028

Table 25: E- 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)							-812
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-2,063
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-19,895
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-1,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-4,092
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-34,021
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-1,620
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-1,559

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							92.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083

Table 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)							-173
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,384
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-107
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,664
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-173
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,661

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-3,048
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,071
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							164
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,407
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,977
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							329
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,478

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)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		28.4	19.2	12.2	10.9	5.28	1.53
Premature deaths from air pollution - Mobile - On-Road (deaths)		103	101	80.7	48.7	22.8	8.74
Premature deaths from air pollution - Gas Stations (deaths)		10.8	10.5	8.3	5.07	2.45	1.05
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		23.1	22.4	17.7	11	5.68	2.33
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.086	0.076	0.059	0.04	0.025	0.015
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.34	2.41	2.09	1.5	0.868	0.412
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.278	0.277	0.274	0.269	0.262	0.252
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.91	8.55	6.99	4.7	2.67	1.29
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.47	1.25	1.03	0.817	0.607	0.406
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.84	1.65	1.42	1.17	0.898	0.618

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.79	0.198	0.186	0.166	0.156	0.041
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		160	153	130	95.7	55.8	5.56
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		220	0.264	0.262	0.199	0.123	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		251	170	108	96.9	46.8	13.5
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		914	899	717	433	203	77.7
Monetary damages from air pollution - Gas Stations (million \$2019)		95.6	92.9	73.5	44.9	21.7	9.26
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		205	199	157	97.5	50.3	20.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.758	0.672	0.519	0.355	0.223	0.135
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		20.8	21.3	18.5	13.3	7.69	3.65
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.46	2.45	2.42	2.38	2.32	2.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		78.9	75.7	61.8	41.6	23.7	11.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13	11	9.15	7.24	5.38	3.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		16.3	14.6	12.6	10.3	7.95	5.47
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		15.8	1.75	1.64	1.46	1.38	0.358
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,422	1,362	1,154	849	496	49.3

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		227	239	217	154	220	318
By economic sector - Construction (jobs)		12,474	16,695	22,569	30,681	39,028	70,920
By economic sector - Manufacturing (jobs)		13,359	16,285	19,914	20,225	18,669	30,796
By economic sector - Mining (jobs)		14,317	11,007	8,137	4,925	2,650	416
By economic sector - Other (jobs)		954	1,634	2,431	3,759	5,624	12,851
By economic sector - Pipeline (jobs)		1,265	1,147	945	666	411	91.9
By economic sector - Professional (jobs)		7,832	10,239	14,304	19,814	26,539	45,182
By economic sector - Trade (jobs)		7,766	8,403	10,005	12,281	15,719	27,417
By economic sector - Utilities (jobs)		8,185	10,364	15,725	24,013	30,198	56,301
By resource sector - Biomass (jobs)		549	555	487	397	826	1,433
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		1,797	395	82	67.9	59	38.1
By resource sector - Grid (jobs)		8,922	14,022	26,024	42,550	54,940	108,779

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		13,855	11,618	8,213	6,411	4,337	2,316
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		25,200	22,541	19,524	13,291	8,434	1,605
By resource sector - Solar (jobs)		6,911	10,157	12,201	16,517	23,133	58,187
By resource sector - Wind (jobs)		9,143	16,724	27,716	37,285	47,328	71,935
By education level - All sectors - High school diploma or less (jobs)		27,167	31,304	38,899	47,936	56,770	100,683
By education level - All sectors - Associates degree or some college (jobs)		19,642	23,015	29,180	36,908	44,519	79,164
By education level - All sectors - Bachelors degree (jobs)		15,399	17,027	20,460	24,602	29,119	49,675
By education level - All sectors - Masters or professional degree (jobs)		3,643	4,065	4,964	6,137	7,470	12,789
By education level - All sectors - Doctoral degree (jobs)		526	601	744	937	1,180	1,982
Related work experience - All sectors - None (jobs)		9,254	10,670	13,301	16,579	19,867	35,225
Related work experience - All sectors - Up to 1 year (jobs)		12,802	14,877	18,621	23,052	27,538	48,968
Related work experience - All sectors - 1 to 4 years (jobs)		24,451	27,756	34,203	42,116	50,192	87,752
Related work experience - All sectors - 4 to 10 years (jobs)		15,540	17,801	22,099	27,447	32,854	57,397
Related work experience - All sectors - Over 10 years (jobs)		4,330	4,909	6,022	7,324	8,606	14,950
On-the-Job Training - All sectors - None (jobs)		3,726	4,213	5,142	6,290	7,541	13,269
On-the-Job Training - All sectors - Up to 1 year (jobs)		44,856	50,996	62,792	76,763	90,969	159,202
On-the-Job Training - All sectors - 1 to 4 years (jobs)		13,346	15,496	19,491	24,571	29,570	52,266
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,789	4,538	5,879	7,762	9,655	17,248
On-the-Job Training - All sectors - Over 10 years (jobs)		661	768	943	1,133	1,322	2,307
On-Site or In-Plant Training - All sectors - None (jobs)		10,751	12,381	15,368	19,008	22,800	40,036
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		40,564	46,101	56,791	69,537	82,449	144,485
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		10,468	12,116	15,184	19,031	22,818	40,323
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,094	4,812	6,122	7,929	9,755	17,248
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		499	602	782	1,013	1,236	2,201
Wage income - All (million \$2019)		4,082	4,646	5,751	7,149	8,615	15,159

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

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

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)		2.81	2.93	5.73	6.16	6.1	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	111	542	974	2,485	3,997	5,204	6,412
Vehicle stocks - LDV – All others (1000 units)	5,347	5,091	4,835	3,524	2,212	1,251	291
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,014	2,644	4,211	6,408	6,943	6,637
Public EV charging plugs - DC Fast (1000 units)	0.303		1.77		7.25		11.6
Public EV charging plugs - L2 (1000 units)	2.12		42.5		174		280

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 (%)	5.62	14.5	37.2	82.6	92	92.7	92.7
Sales of space heating units - Electric Resistance (%)	7.65	13.8	11	4.91	3.67	3.58	3.63
Sales of space heating units - Gas (%)	83.5	66	47.3	10.4	2.8	2.21	2.19
Sales of space heating units - Fossil (%)	3.24	5.67	4.53	2.12	1.56	1.5	1.52
Sales of water heating units - Electric Heat Pump (%)	0	0.93	12.1	36.4	41.4	41.7	41.8
Sales of water heating units - Electric Resistance (%)	13.2	25.9	34.2	52.7	56.7	57	57
Sales of water heating units - Gas Furnace (%)	85.7	72	52.4	9.64	0.728	0.02	0
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.21	1.21	1.21
Sales of cooking units - Electric Resistance (%)	50.5	61	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.5	39	6.67	0.336	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		4.42	4.7				

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 (%)	2.64	8.18	30.6	79.8	90	90.8	90.8
Sales of space heating units - Electric Resistance (%)	2.48	3.49	4.92	8.08	8.66	8.7	8.7
Sales of space heating units - Gas (%)	94.9	88.1	64.4	12.2	1.37	0.522	0.498
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.022	1.12	14.3	42.9	48.9	49.4	49.4
Sales of water heating units - Electric Resistance (%)	1.1	2.5	15.4	43.8	49.7	50.2	50.2
Sales of water heating units - Gas (%)	98.6	96	69.9	12.9	0.972	0.027	0
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		14,374	15,990				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,905	2,238	0	0	0	0	0
Installed thermal - Natural gas (MW)	5,482	5,265	7,178	6,783	8,005	11,160	13,419

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	895	1,362	1,825	2,410	3,134	4,018	5,120
Installed renewables - Solar - Base land use assumptions (MW)	454	454	2,501	4,835	8,938	16,787	55,294
Installed renewables - Wind - Base land use assumptions (MW)	4,732	5,218	6,428	8,188	13,808	21,290	57,595
Installed renewables - Solar - Constrained land use assumptions (MW)	454	1,252	4,243	5,358	8,781	14,752	55,550
Installed renewables - Wind - Constrained land use assumptions (MW)	5,272	5,479	6,383	10,943	23,116	40,784	105,272
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	2.45	2.57	4.26	7.7	35.7
Capital invested - Wind - Base (billion \$2018)		0.715	1.61	2.18	6.64	8.39	38.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,142	1,142	5,652	10,876	19,953	37,504	123,424
Wind - Base land use assumptions (GWh)	16,760	18,526	22,799	28,841	47,644	72,002	183,350
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	2,284	5,770	18,873	23,815	39,015	66,004	246,102
Wind - Constrained land use assumptions (GWh)	33,520	34,931	40,883	68,991	140,044	236,672	541,171
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 tCO2e/y)							-812
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-4,092
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-34,021
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-1,620
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-3,239
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-48,148
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-6,121
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228

Table 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 - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-173
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-1,384
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-107
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-1,664
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-173
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-2,661
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-3,048
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,071
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							164
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,407
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,977
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							329
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,478

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)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		30.1	21	21.8	41.5	19	2.18
Premature deaths from air pollution - Mobile - On-Road (deaths)		103	101	80.7	48.7	22.8	8.74
Premature deaths from air pollution - Gas Stations (deaths)		10.8	10.5	8.3	5.07	2.45	1.05

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		23.1	22.4	17.7	11	5.68	2.33
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.086	0.076	0.059	0.04	0.025	0.015
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.34	2.41	2.09	1.5	0.868	0.412
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.278	0.277	0.274	0.269	0.262	0.252
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.91	8.55	6.99	4.7	2.67	1.29
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.47	1.25	1.03	0.817	0.607	0.406
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.84	1.65	1.42	1.17	0.898	0.618
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.34	0.196	0.186	0.167	0.159	0.04
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		167	166	169	153	134	104
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		220	0.264	0.262	0.199	0.123	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		267	186	193	368	169	19.3
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		914	899	717	433	203	77.7
Monetary damages from air pollution - Gas Stations (million \$2019)		95.6	92.9	73.5	44.9	21.7	9.26
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		205	199	157	97.5	50.3	20.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.758	0.672	0.519	0.355	0.223	0.135
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		20.8	21.3	18.5	13.3	7.69	3.65
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.46	2.45	2.42	2.38	2.32	2.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		78.9	75.7	61.8	41.6	23.7	11.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13	11	9.15	7.24	5.38	3.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		16.3	14.6	12.6	10.3	7.95	5.47
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		11.8	1.73	1.64	1.48	1.4	0.354

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,481	1,477	1,499	1,363	1,188	925

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		229	234	215	174	284	316
By economic sector - Construction (jobs)		13,194	14,170	14,779	16,741	16,985	20,199
By economic sector - Manufacturing (jobs)		12,923	12,656	13,851	12,510	9,658	9,729
By economic sector - Mining (jobs)		14,581	11,465	9,278	6,399	4,486	2,853
By economic sector - Other (jobs)		1,118	1,240	1,426	1,968	2,113	3,405
By economic sector - Pipeline (jobs)		1,312	1,421	1,199	1,042	905	815
By economic sector - Professional (jobs)		7,913	8,165	8,721	9,849	10,604	12,301
By economic sector - Trade (jobs)		7,919	7,426	7,362	7,361	7,286	8,291
By economic sector - Utilities (jobs)		8,507	9,231	10,574	12,465	13,654	15,184
By resource sector - Biomass (jobs)		549	538	485	492	1,119	1,349
By resource sector - CO2 (jobs)		18.9	1,658	378	638	1,008	1,885
By resource sector - Coal (jobs)		1,844	481	82.1	68.1	59.3	38
By resource sector - Grid (jobs)		9,127	10,286	14,696	18,524	20,740	23,540
By resource sector - Natural Gas (jobs)		14,844	12,730	11,947	10,564	9,264	7,614
By resource sector - Nuclear (jobs)		0	0.005	0.02	0.02	0.045	0.182
By resource sector - Oil (jobs)		25,198	22,582	20,059	14,538	11,082	7,609
By resource sector - Solar (jobs)		8,850	7,830	7,958	10,228	9,303	17,801
By resource sector - Wind (jobs)		7,264	9,903	11,800	13,456	13,400	13,256
By education level - All sectors - High school diploma or less (jobs)		27,753	27,161	27,871	28,377	27,206	30,268
By education level - All sectors - Associates degree or some college (jobs)		20,072	19,841	20,492	21,274	20,691	23,255
By education level - All sectors - Bachelors degree (jobs)		15,631	14,937	14,959	14,748	14,055	15,167
By education level - All sectors - Masters or professional degree (jobs)		3,704	3,552	3,566	3,580	3,494	3,816
By education level - All sectors - Doctoral degree (jobs)		535	517	517	529	529	586
Related work experience - All sectors - None (jobs)		9,462	9,294	9,528	9,763	9,461	10,561
Related work experience - All sectors - Up to 1 year (jobs)		13,056	12,736	13,080	13,366	12,832	14,430
Related work experience - All sectors - 1 to 4 years (jobs)		24,926	24,220	24,661	24,946	24,013	26,445
Related work experience - All sectors - 4 to 10 years (jobs)		15,851	15,496	15,798	16,091	15,547	17,162
Related work experience - All sectors - Over 10 years (jobs)		4,400	4,262	4,339	4,343	4,121	4,495
On-the-Job Training - All sectors - None (jobs)		3,804	3,661	3,687	3,712	3,555	3,969
On-the-Job Training - All sectors - Up to 1 year (jobs)		45,644	44,241	45,124	45,429	43,470	47,895
On-the-Job Training - All sectors - 1 to 4 years (jobs)		13,655	13,475	13,828	14,288	13,890	15,486
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,920	3,972	4,099	4,410	4,435	5,048
On-the-Job Training - All sectors - Over 10 years (jobs)		673	658	667	670	625	694
On-Site or In-Plant Training - All sectors - None (jobs)		10,957	10,670	10,864	11,057	10,645	11,875
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		41,299	40,042	40,845	41,166	39,418	43,451

Table 39: *E+RE- 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)		10,703	10,537	10,810	11,120	10,773	11,990
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,223	4,238	4,342	4,588	4,567	5,131
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		512	520	544	578	572	645
Wage income - All (million \$2019)		4,164	4,090	4,197	4,278	4,176	4,615

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

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

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)		2.81	2.93	5.73	6.16	6.1	6.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	111	542	974	2,485	3,997	5,204	6,412
Vehicle stocks - LDV – All others (1000 units)	5,347	5,091	4,835	3,524	2,212	1,251	291
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,014	2,644	4,211	6,408	6,943	6,637
Public EV charging plugs - DC Fast (1000 units)	0.303		1.77		7.25		11.6
Public EV charging plugs - L2 (1000 units)	2.12		42.5		174		280

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 (%)	5.62	14.5	37.2	82.6	92	92.7	92.7
Sales of space heating units - Electric Resistance (%)	7.65	13.8	11	4.91	3.67	3.58	3.63
Sales of space heating units - Gas (%)	83.5	66	47.3	10.4	2.8	2.21	2.19
Sales of space heating units - Fossil (%)	3.24	5.67	4.53	2.12	1.56	1.5	1.52
Sales of water heating units - Electric Heat Pump (%)	0	0.93	12.1	36.4	41.4	41.7	41.8
Sales of water heating units - Electric Resistance (%)	13.2	25.9	34.2	52.7	56.7	57	57
Sales of water heating units - Gas Furnace (%)	85.7	72	52.4	9.64	0.728	0.02	0
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.21	1.21	1.21
Sales of cooking units - Electric Resistance (%)	50.5	61	93.3	99.7	100	100	100
Sales of cooking units - Gas (%)	49.5	39	6.67	0.336	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		4.42	4.7				

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 (%)	2.64	8.18	30.6	79.8	90	90.8	90.8
Sales of space heating units - Electric Resistance (%)	2.48	3.49	4.92	8.08	8.66	8.7	8.7
Sales of space heating units - Gas (%)	94.9	88.1	64.4	12.2	1.37	0.522	0.498
Sales of space heating units - Fossil (%)	0	0.208	0.04	0.002	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.022	1.12	14.3	42.9	48.9	49.4	49.4
Sales of water heating units - Electric Resistance (%)	1.1	2.5	15.4	43.8	49.7	50.2	50.2
Sales of water heating units - Gas (%)	98.6	96	69.9	12.9	0.972	0.027	0
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383
Sales of cooking units - Electric Resistance (%)	41.9	54.6	83	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	58.1	45.4	17	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		14,374	15,990				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,905	2,891	0	0	0	0	0
Installed thermal - Natural gas (MW)	5,462	4,826	5,372	7,837	5,920	9,185	13,172
Installed thermal - Nuclear (MW)	0	0	0.002	0.01	0.017	0.033	0.106
Installed renewables - Rooftop PV (MW)	895	1,362	1,825	2,410	3,134	4,018	5,120
Installed renewables - Solar - Base land use assumptions (MW)	1,405	2,712	3,769	4,105	6,353	6,891	9,581
Installed renewables - Wind - Base land use assumptions (MW)	4,732	4,847	5,862	6,307	7,187	8,342	8,706
Installed renewables - Solar - Constrained land use assumptions (MW)	820	2,262	3,666	4,656	6,810	8,724	11,272
Installed renewables - Wind - Constrained land use assumptions (MW)	4,732	4,905	5,233	5,667	8,180	10,809	11,780
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		1.75	1.27	0.371	2.34	0.528	2.49
Capital invested - Wind - Base (billion \$2018)		0.169	1.35	0.606	1.04	1.29	0.427
Capital invested - Solar PV - Constrained (billion \$2018)		1.93	1.68	1.09	2.24	1.88	2.36
Capital invested - Wind - Constrained (billion \$2018)		0.254	0.437	0.539	2.97	2.95	1.03

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,250	6,134	8,488	9,238	14,326	15,554	21,505
Wind - Base land use assumptions (GWh)	16,760	17,191	20,850	22,536	25,565	29,515	30,892
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	1,939	5,073	8,204	10,399	15,190	19,483	25,119
Wind - Constrained land use assumptions (GWh)	16,760	17,346	18,438	19,845	27,647	35,817	38,773
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)							-812
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,092
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-34,021
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-1,620
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121

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 - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211

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 - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,977
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							329
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,478

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)		24.8	0.03	0.03	0.022	0.014	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		30.5	22.1	19.2	16.7	9.32	2.28
Premature deaths from air pollution - Mobile - On-Road (deaths)		104	111	113	106	88	62.5
Premature deaths from air pollution - Gas Stations (deaths)		11	11.7	11.8	11.1	9.14	6.5
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		23.2	23.6	23.5	22.1	18.7	13.6
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.088	0.087	0.083	0.076	0.065	0.054
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.36	2.57	2.76	2.77	2.41	1.84
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.278	0.277	0.274	0.269	0.262	0.252
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		8.93	9.18	9.25	8.79	7.62	5.92
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.47	1.34	1.22	1.09	0.964	0.834
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.84	1.77	1.67	1.54	1.41	1.26
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.55	0.201	0.201	0.195	0.184	0.171
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		163	148	125	106	92.6	69
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		220	0.264	0.262	0.199	0.123	0.001
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		270	196	170	148	82.5	20.2
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		929	987	1,006	945	783	556
Monetary damages from air pollution - Gas Stations (million \$2019)		97.5	104	105	98	80.9	57.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		205	209	208	196	165	120
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.78	0.774	0.74	0.67	0.578	0.477
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		20.9	22.7	24.5	24.6	21.3	16.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.46	2.45	2.42	2.38	2.32	2.23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		79	81.3	81.9	77.8	67.4	52.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13	11.9	10.8	9.69	8.53	7.39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		16.3	15.6	14.8	13.7	12.5	11.1
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		13.7	1.77	1.77	1.72	1.63	1.51
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,451	1,317	1,108	942	822	613

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		228	233	215	230	401	359
By economic sector - Construction (jobs)		12,853	15,717	17,718	19,012	23,537	27,987
By economic sector - Manufacturing (jobs)		12,280	15,406	14,021	11,774	12,940	13,791
By economic sector - Mining (jobs)		14,389	10,963	8,454	6,516	4,951	2,795
By economic sector - Other (jobs)		1,036	1,353	1,869	2,253	3,026	4,439
By economic sector - Pipeline (jobs)		1,281	1,315	1,028	942	857	701
By economic sector - Professional (jobs)		7,918	9,554	11,197	12,443	15,872	19,386
By economic sector - Trade (jobs)		7,845	8,027	8,568	8,910	10,443	12,189
By economic sector - Utilities (jobs)		8,217	10,279	11,218	12,440	17,742	20,520
By resource sector - Biomass (jobs)		554	538	486	756	1,847	1,730
By resource sector - CO2 (jobs)		18.8	1,498	337	595	931	1,696
By resource sector - Coal (jobs)		1,732	396	84.9	72.6	62.9	53.8
By resource sector - Grid (jobs)		8,878	12,745	16,953	19,560	29,933	35,500
By resource sector - Natural Gas (jobs)		14,122	11,092	8,158	6,493	5,669	3,967
By resource sector - Nuclear (jobs)		0	0.004	0.008	0.009	0.02	0.037
By resource sector - Oil (jobs)		25,245	22,812	20,662	18,424	16,009	9,779
By resource sector - Solar (jobs)		6,968	7,374	9,393	10,139	12,409	19,816
By resource sector - Wind (jobs)		8,527	16,392	18,211	18,482	22,908	29,627
By education level - All sectors - High school diploma or less (jobs)		27,012	29,968	30,563	30,564	36,843	41,764
By education level - All sectors - Associates degree or some college (jobs)		19,538	22,031	22,666	22,942	28,035	32,449
By education level - All sectors - Bachelors degree (jobs)		15,325	16,377	16,457	16,341	19,287	21,567
By education level - All sectors - Masters or professional degree (jobs)		3,643	3,899	3,995	4,045	4,848	5,512
By education level - All sectors - Doctoral degree (jobs)		529	572	606	629	756	876

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - None (jobs)		9,220	10,232	10,472	10,561	12,811	14,630
Related work experience - All sectors - Up to 1 year (jobs)		12,714	14,177	14,537	14,554	17,603	20,211
Related work experience - All sectors - 1 to 4 years (jobs)		24,343	26,637	27,112	27,194	32,646	36,961
Related work experience - All sectors - 4 to 10 years (jobs)		15,478	17,089	17,431	17,531	21,125	24,063
Related work experience - All sectors - Over 10 years (jobs)		4,292	4,710	4,734	4,682	5,584	6,303
On-the-Job Training - All sectors - None (jobs)		3,717	4,027	4,098	4,098	4,887	5,577
On-the-Job Training - All sectors - Up to 1 year (jobs)		44,542	48,862	49,580	49,446	59,280	67,084
On-the-Job Training - All sectors - 1 to 4 years (jobs)		13,308	14,868	15,257	15,433	18,765	21,542
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,825	4,355	4,615	4,823	5,988	6,997
On-the-Job Training - All sectors - Over 10 years (jobs)		654	733	736	722	849	968
On-Site or In-Plant Training - All sectors - None (jobs)		10,693	11,836	12,076	12,110	14,580	16,735
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		40,299	44,182	44,852	44,761	53,695	60,767
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		10,431	11,622	11,906	12,012	14,565	16,662
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,125	4,628	4,847	5,017	6,158	7,107
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		498	578	605	622	772	898
Wage income - All (million \$2019)		4,071	4,470	4,588	4,657	5,649	6,435

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

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

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)		2.32	2.38	3.28	3.43	5.13	5.47

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	85.6	212	339	925	1,511	2,809	4,107
Vehicle stocks - LDV – All others (1000 units)	5,368	5,368	5,368	5,092	4,816	3,711	2,606
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	172	344	1,178	3,652	5,339
Public EV charging plugs - DC Fast (1000 units)	0.303		0.614		2.74		7.45
Public EV charging plugs - L2 (1000 units)	2.12		14.8		65.9		179

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 (%)	5.62	13.3	15.8	24.3	44	68.4	82.7
Sales of space heating units - Electric Resistance (%)	7.65	13.9	13.5	12.5	10.1	6.84	4.95
Sales of space heating units - Gas (%)	83.5	67.1	65	58.1	42	22.1	10.3
Sales of space heating units - Fossil (%)	3.24	5.74	5.68	5.1	3.9	2.66	2.01
Sales of water heating units - Electric Heat Pump (%)	0	0.46	1.74	5.96	16.1	28.9	36.5
Sales of water heating units - Electric Resistance (%)	13.2	25.6	26.5	29.7	37.4	47.1	52.9
Sales of water heating units - Gas Furnace (%)	85.7	72.7	70.5	63.1	45.3	22.7	9.32
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.22	1.22	1.21
Sales of cooking units - Electric Resistance (%)	50.3	51.6	56.1	68.1	84.8	95.1	98.7
Sales of cooking units - Gas (%)	49.7	48.4	43.9	31.9	15.2	4.9	1.32
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		4.41	4.7				

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 (%)	2.64	7.26	9.83	18.3	38.7	64.6	80
Sales of space heating units - Electric Resistance (%)	2.48	3.43	3.58	4.11	5.42	7.07	8.03
Sales of space heating units - Gas (%)	94.9	89.1	86.4	77.4	55.8	28.3	12
Sales of space heating units - Fossil (%)	0	0.241	0.225	0.171	0.089	0.035	0.016
Sales of water heating units - Electric Heat Pump (%)	0.022	0.571	2.07	7.05	19	34.1	43.1
Sales of water heating units - Electric Resistance (%)	1.1	2	3.47	8.35	20.1	35.1	44
Sales of water heating units - Gas (%)	98.6	97	94.1	84.2	60.5	30.4	12.5
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383
Sales of cooking units - Electric Resistance (%)	41.9	46.2	50.2	60.8	75.4	84.6	87.8
Sales of cooking units - Gas (%)	58.1	53.8	49.8	39.2	24.6	15.4	12.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		14,373	15,986				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,905	2,238	0	0	0	0	0
Installed thermal - Natural gas (MW)	5,482	5,268	6,832	6,476	5,115	9,206	9,024
Installed thermal - Nuclear (MW)	0	0	0.002	0.005	0.007	0.014	0.028
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0.009	0	0.042
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0.139	0	0.584

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

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	2
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	1	5	5
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - 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	0	1,360	3,889	588
Biomass purchases (million \$2018/y)		0	0	0	117	458	500

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

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

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

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

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

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

Table 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)							-812
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-4,092
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-34,021
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-1,620
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-3,239
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-48,148
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-6,121

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 - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211

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 - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083

Table 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 tCO ₂ e/y)							-376
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-1,338
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-102
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO ₂ e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-1,815
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-376
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-2,573
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-205
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO ₂ e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-3,153

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							313
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,000
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							157
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							8.67
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							0.404
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,479
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							313
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,486
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							314
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							8.67
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							0.404
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,123

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)		56.9	27.7	15.7	12.3	10.8	10.4
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		33.6	35.3	34.3	25.5	21.1	8.35
Premature deaths from air pollution - Mobile - On-Road (deaths)		104	112	120	129	137	145
Premature deaths from air pollution - Gas Stations (deaths)		11	11.8	12.6	13.4	14.2	15
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		23.1	23.7	24.4	25.4	26.8	28.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.09	0.088	0.077	0.064	0.054	0.049
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.31	2.53	2.81	3.09	3.27	3.43
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.29	0.303	0.314	0.324	0.333	0.34

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		9.02	9.38	9.12	8.63	8.44	8.73
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.54	1.58	1.64	1.7	1.75	1.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.93	2.09	2.27	2.43	2.6	2.77
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		4.2	2.82	2.22	2.14	2.08	1.96
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		165	185	201	199	208	207
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		504	246	139	109	95.6	91.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		298	312	304	226	187	74
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		927	999	1,069	1,143	1,217	1,293
Monetary damages from air pollution - Gas Stations (million \$2019)		97.2	104	111	119	126	133
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		205	210	216	225	237	250
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		0.799	0.775	0.68	0.567	0.483	0.436
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		20.5	22.4	24.9	27.4	29	30.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		2.57	2.68	2.78	2.87	2.95	3.01
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		79.8	83	80.8	76.4	74.7	77.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		13.6	14	14.5	15	15.5	16
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		17.1	18.5	20.1	21.5	23	24.6
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		37	24.9	19.6	18.9	18.4	17.3
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,463	1,647	1,781	1,771	1,847	1,842

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		228	227	227	225	225	225
By economic sector - Construction (jobs)		8,505	10,987	11,700	12,936	13,830	15,600
By economic sector - Manufacturing (jobs)		7,857	10,159	12,078	11,817	9,696	9,782
By economic sector - Mining (jobs)		15,059	12,562	10,470	8,429	6,961	5,413

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		329	832	993	1,253	1,488	2,361
By economic sector - Pipeline (jobs)		1,308	1,362	1,383	1,321	1,322	1,261
By economic sector - Professional (jobs)		5,975	6,688	6,879	7,675	8,232	9,265
By economic sector - Trade (jobs)		6,953	6,920	6,698	6,824	6,940	7,524
By economic sector - Utilities (jobs)		7,148	7,643	8,084	9,121	9,967	9,847
By resource sector - Biomass (jobs)		550	534	518	503	493	484
By resource sector - CO2 (jobs)		0	0.021	0.027	0.029	0.032	0.034
By resource sector - Coal (jobs)		2,796	1,570	881	675	434	269
By resource sector - Grid (jobs)		6,630	7,432	8,543	10,808	12,198	12,606
By resource sector - Natural Gas (jobs)		14,815	15,206	14,948	13,749	13,725	12,594
By resource sector - Nuclear (jobs)		0	0.002	0.004	0.005	0.01	0.018
By resource sector - Oil (jobs)		25,283	22,911	20,887	18,881	17,273	14,602
By resource sector - Solar (jobs)			4,628	5,982	6,346	6,748	12,523
By resource sector - Wind (jobs)		3,290	5,099	6,753	8,641	7,790	8,199
By education level - All sectors - High school diploma or less (jobs)		21,609	23,531	24,190	24,705	24,289	25,462
By education level - All sectors - Associates degree or some college (jobs)		15,431	16,957	17,513	18,063	17,937	18,963
By education level - All sectors - Bachelors degree (jobs)		12,827	13,284	13,241	13,229	12,861	13,149
By education level - All sectors - Masters or professional degree (jobs)		3,059	3,152	3,120	3,147	3,110	3,213
By education level - All sectors - Doctoral degree (jobs)		437	455	448	459	463	491
Related work experience - All sectors - None (jobs)		7,421	8,051	8,252	8,454	8,380	8,802
Related work experience - All sectors - Up to 1 year (jobs)		9,998	10,926	11,232	11,484	11,250	11,917
Related work experience - All sectors - 1 to 4 years (jobs)		19,932	21,227	21,541	21,879	21,533	22,379
Related work experience - All sectors - 4 to 10 years (jobs)		12,537	13,457	13,698	13,966	13,789	14,355
Related work experience - All sectors - Over 10 years (jobs)		3,476	3,717	3,788	3,820	3,709	3,825
On-the-Job Training - All sectors - None (jobs)		3,005	3,195	3,213	3,244	3,176	3,340
On-the-Job Training - All sectors - Up to 1 year (jobs)		36,191	38,673	39,383	39,918	39,017	40,596
On-the-Job Training - All sectors - 1 to 4 years (jobs)		10,644	11,591	11,884	12,213	12,147	12,736
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,023	3,363	3,455	3,644	3,761	4,016
On-the-Job Training - All sectors - Over 10 years (jobs)		499	557	577	583	561	591
On-Site or In-Plant Training - All sectors - None (jobs)		8,505	9,192	9,372	9,539	9,355	9,843
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		32,789	35,022	35,649	36,150	35,376	36,805
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		8,362	9,090	9,318	9,556	9,478	9,927
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,318	3,637	3,713	3,875	3,962	4,183
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		388	438	459	483	490	520
Wage income - All (million \$2019)		3,380	3,613	3,692	3,784	3,781	3,946

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	472	451	423	407	409	422	438

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

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

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)		2.52	2.6	3.5	3.68	4	4.2

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 (%)	5.05	16.1	16.5	17	17.5	17.9	18.5
Sales of space heating units - Electric Resistance (%)	7.73	13.4	13.3	13.2	13.1	12.7	12.1
Sales of space heating units - Gas (%)	83.9	65	64.8	64.4	64.3	64.4	64.2
Sales of space heating units - Fossil (%)	3.28	5.42	5.49	5.36	5.12	5.04	5.13
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	13.2	25.2	25.3	25.3	25.4	25.4	25.4
Sales of water heating units - Gas Furnace (%)	85.7	73.5	73.5	73.5	73.4	73.4	73.4
Sales of water heating units - Other (%)	1.07	1.23	1.23	1.23	1.22	1.22	1.22
Sales of cooking units - Electric Resistance (%)	49.8	49.8	49.8	49.8	49.8	49.8	49.8
Sales of cooking units - Gas (%)	50.2	50.2	50.2	50.2	50.2	50.2	50.2
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		4.33	4.39				

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 (%)	2.64	13.8	46.2	73.2	77.9	78.5	78.5
Sales of space heating units - Electric Resistance (%)	2.48	4.35	8.94	16	20.3	21	21
Sales of space heating units - Gas (%)	94.9	81.6	44.8	10.8	1.79	0.573	0.499
Sales of space heating units - Fossil (%)	0	0.226	0.135	0.038	0.005	0	0
Sales of water heating units - Electric Heat Pump (%)	0.022	0.03	0.03	0.03	0.03	0.03	0.03
Sales of water heating units - Electric Resistance (%)	1.1	1.47	1.47	1.48	1.46	1.48	1.47
Sales of water heating units - Gas (%)	98.6	98.1	98.1	98.1	98.1	98.1	98.1
Sales of water heating units - Other (%)	0.269	0.383	0.382	0.383	0.382	0.383	0.383
Sales of cooking units - Electric Resistance (%)	41.9	44.7	44.7	44.6	44.4	44.5	44.6
Sales of cooking units - Gas (%)	58.1	55.3	55.3	55.4	55.6	55.5	55.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		14,192	14,841				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,905	3,567	1,685	857	857	0	0
Installed thermal - Natural gas (MW)	5,482	4,370	6,784	7,114	6,700	8,304	7,394
Installed thermal - Nuclear (MW)	0	0	0.001	0.003	0.004	0.008	0.014
Installed renewables - Rooftop PV (MW)	895	1,362	1,825	2,410	3,134	4,018	5,120

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Base land use assumptions (MW)	454	454	454	454	454	454	454
Installed renewables - Wind - Base land use assumptions (MW)	4,732	4,732	4,732	4,732	5,862	6,384	6,384

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,142	1,142	1,142	1,142	1,142	1,142	1,142
Wind - Base land use assumptions (GWh)	16,760	16,760	16,760	16,760	20,850	22,799	22,799
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)	6.25		4.02				1.15
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.047		-0.099				-0.104
Business-as-usual carbon sink - Total (Mt CO2e/y)	6.2		3.93				1.05

Table 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)							-812
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-260
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,547
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-13.7
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-58.1
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-446
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-12,451
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-245
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,063
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,895
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,216
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,390
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-20
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-116
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-859
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-18,676

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-1,742
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-4,092
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-34,021
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-1,620
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-1,559
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-9,233
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-26.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-174
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-1,273
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-24,902
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-3,239
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-48,148
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-6,121
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							133
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							198
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,804
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							4.95
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							63.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							823
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							15.9
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,228
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,270
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							199
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							205

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,256
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							7.44
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							92.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							1,235
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							115
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,472
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							7,582
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							265
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							211
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,708
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							9.89
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							121
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							1,646
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							92
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,029
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,083