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 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
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 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
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/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 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

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 tCO2e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/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 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
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 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
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/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 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
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/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 tCO2e/y)							-376
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,338
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-102
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,815
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-376
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,573
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-205
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-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 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
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