Net-Zero America - Oklahoma 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)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		26.9	14	6.25	4.66	2.7	1.44
Premature deaths from air pollution - Mobile - On-Road (deaths)		75.8	71.3	54.5	31.6	14.5	5.72
Premature deaths from air pollution - Gas Stations (deaths)		9.32	8.65	6.61	3.98	2.01	1.02
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		10	8.11	5.33	2.87	1.32	0.555
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.142	0.118	0.084	0.051	0.025	0.011
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.65	1.48	1.14	0.747	0.401	0.198
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.888	0.854	0.816	0.774	0.731	0.685
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		7.19	6.21	4.35	2.56	1.43	0.835
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.49	1.21	0.961	0.727	0.521	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.692	0.587	0.485	0.383	0.284	0.189
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.04	0.198	0.188	0.175	0.169	0.164
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		173	164	151	118	88.6	55.5
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		266	0.238	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		238	124	55.4	41.2	23.9	12.8
Monetary damages from air pollution - Mobile - On-Road (million $2019)		674	634	485	281	129	50.9
Monetary damages from air pollution - Gas Stations (million $2019)		82.5	76.6	58.5	35.3	17.8	9.02
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		88.7	71.8	47.2	25.4	11.7	4.92
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.26	1.05	0.741	0.453	0.222	0.096
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		14.6	13.2	10.1	6.62	3.55	1.76
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		7.87	7.56	7.22	6.86	6.47	6.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		63.6	54.9	38.5	22.7	12.7	7.39

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)		13.2	10.7	8.51	6.44	4.61	3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		6.13	5.2	4.29	3.39	2.51	1.67
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		9.18	1.75	1.66	1.54	1.49	1.45
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,535	1,455	1,339	1,049	787	492

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		27.4	55.6	505	554	642	566
By economic sector - Construction (jobs)		17,395	23,380	29,455	34,194	39,930	43,669
By economic sector - Manufacturing (jobs)		24,039	25,963	28,985	25,991	21,691	21,595
By economic sector - Mining (jobs)		35,058	27,735	21,464	14,038	9,029	4,915
By economic sector - Other (jobs)		998	1,514	2,299	3,269	4,623	5,324
By economic sector - Pipeline (jobs)		1,798	2,040	1,681	1,137	881	643
By economic sector - Professional (jobs)		15,201	18,354	23,496	27,674	32,417	36,818
By economic sector - Trade (jobs)		13,211	14,016	15,762	16,956	19,074	21,023
By economic sector - Utilities (jobs)		13,004	16,889	21,886	25,802	30,039	34,689
By resource sector - Biomass (jobs)		118	153	1,439	1,667	2,340	2,416
By resource sector - CO2 (jobs)		53.6	3,571	2,476	756	1,295	1,714
By resource sector - Coal (jobs)		679	47.7	0.976	0.751	0.607	0.518
By resource sector - Grid (jobs)		13,113	19,811	31,722	41,421	50,843	60,951
By resource sector - Natural Gas (jobs)		34,455	26,923	20,616	15,610	10,051	5,835
By resource sector - Nuclear (jobs)		0	0.003	0.006	0	0	0
By resource sector - Oil (jobs)		52,247	47,100	42,254	30,570	22,744	13,938
By resource sector - Solar (jobs)		2,963	3,622	5,224	6,822	10,257	9,305
By resource sector - Wind (jobs)		17,101	28,717	41,803	52,768	60,796	75,080
By education level - All sectors - High school diploma or less (jobs)		47,116	51,410	58,098	59,756	63,147	67,202
By education level - All sectors - Associates degree or some college (jobs)		35,164	38,736	44,081	46,184	49,548	53,664
By education level - All sectors - Bachelors degree (jobs)		30,081	31,093	33,756	33,802	35,101	37,079
By education level - All sectors - Masters or professional degree (jobs)		7,294	7,572	8,322	8,521	9,056	9,699
By education level - All sectors - Doctoral degree (jobs)		1,074	1,135	1,277	1,351	1,475	1,596
Related work experience - All sectors - None (jobs)		16,460	17,898	20,198	20,920	22,299	23,908
Related work experience - All sectors - Up to 1 year (jobs)		22,092	24,144	27,530	28,621	30,517	32,800
Related work experience - All sectors - 1 to 4 years (jobs)		45,201	48,279	53,708	54,878	57,834	61,564
Related work experience - All sectors - 4 to 10 years (jobs)		28,777	30,965	34,572	35,586	37,705	40,380
Related work experience - All sectors - Over 10 years (jobs)		8,198	8,659	9,526	9,609	9,972	10,589
On-the-Job Training - All sectors - None (jobs)		6,783	7,160	7,920	8,104	8,592	9,165
On-the-Job Training - All sectors - Up to 1 year (jobs)		81,853	87,388	97,492	99,434	104,420	111,166

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)		24,273	26,527	29,894	31,083	33,207	35,734
On-the-Job Training - All sectors - 4 to 10 years (jobs)		6,630	7,588	8,809	9,558	10,622	11,604
On-the-Job Training - All sectors - Over 10 years (jobs)		1,190	1,282	1,421	1,435	1,486	1,571
On-Site or In-Plant Training - All sectors - None (jobs)		19,612	21,084	23,672	24,439	25,954	27,870
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		73,906	78,940	88,027	89,823	94,404	100,516
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		18,984	20,691	23,279	24,106	25,660	27,526
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		7,351	8,228	9,388	9,993	10,941	11,835
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		876	1,002	1,169	1,253	1,368	1,494
Wage income - All (million $2019)		6,715	7,181	7,999	8,203	8,699	9,330

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		102	87.7	66.7	45.9	29.6	14.7
Oil consumption - Cumulative (million bbls)							2,028
Oil production - Annual (million bbls)		260	261	261	206	168	112
Natural gas consumption - Annual (tcf)		626	528	423	319	200	139
Natural gas consumption - Cumulative (tcf)							12,746
Natural gas production - Annual (tcf)		3,291	3,111	2,709	2,291	1,817	1,411

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	431	405	359	302	250	219	207
Final energy use - Residential (PJ)	177	168	153	133	115	105	99.9
Final energy use - Commercial (PJ)	121	122	117	109	103	101	103
Final energy use - Industry (PJ)	310	318	324	323	325	323	330

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)		2.97	3.05	4.83	5.11	4.99	5.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	19.7	322	624	1,681	2,738	3,583	4,428
Vehicle stocks - LDV – All others (1000 units)	3,692	3,516	3,339	2,434	1,528	864	201
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		710	1,819	2,948	4,465	4,860	4,634
Public EV charging plugs - DC Fast (1000 units)	0.326		1.4		6.16		9.97
Public EV charging plugs - L2 (1000 units)	0.301		33.8		148		240

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 (%)	8.53	25.2	76.9	88.5	89	88.9	88.8
Sales of space heating units - Electric Resistance (%)	24.8	26.1	10.9	7.55	7.39	7.53	7.57
Sales of space heating units - Gas (%)	60.7	39.8	8.68	1.75	1.46	1.44	1.43
Sales of space heating units - Fossil (%)	5.91	8.95	3.48	2.25	2.19	2.17	2.16
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.7	72.9	73.4	73.4	73.4
Sales of water heating units - Electric Resistance (%)	30.5	39.9	28.2	25.5	25.4	25.4	25.4
Sales of water heating units - Gas Furnace (%)	68.2	47.2	8.93	0.373	0	0	0
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.2	1.19	1.2	1.2
Sales of cooking units - Electric Resistance (%)	40.4	53.1	92	99.6	100	100	100
Sales of cooking units - Gas (%)	59.6	46.9	8.02	0.404	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.2	3.89				

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 (%)	1.94	26.9	77	91.1	92.3	92.3	92.3
Sales of space heating units - Electric Resistance (%)	2	4.42	4.72	6.04	6.33	6.36	6.38
Sales of space heating units - Gas (%)	96.1	68.7	18.2	2.83	1.38	1.34	1.33
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.059	10.7	56.4	66.5	67	67	66.9
Sales of water heating units - Electric Resistance (%)	1.74	8.05	26.9	31.1	31.3	31.3	31.3
Sales of water heating units - Gas (%)	97.4	79.4	15	0.632	0	0	0
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79
Sales of cooking units - Electric Resistance (%)	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		14,173	16,554				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,259	350	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,067	9,237	9,519	9,519	6,924	4,650	4,593
Installed thermal - Nuclear (MW)	0	0	0.001	0.004	0	0	0
Installed renewables - Rooftop PV (MW)	130	228	333	490	714	1,005	1,384
Installed renewables - Solar - Base land use assumptions (MW)	222	222	222	222	1,269	5,813	6,870
Installed renewables - Wind - Base land use assumptions (MW)	9,420	11,527	17,669	31,558	45,644	56,327	57,442
Installed renewables - Solar - Constrained land use assumptions (MW)	214	675	4,249	10,886	17,746	23,674	26,614
Installed renewables - Wind - Constrained land use assumptions (MW)	11,527	11,868	17,422	28,542	40,274	48,054	48,365
Capital invested - Solar PV - Base (billion $2018)		0	0	0	1.09	4.46	0.979
Capital invested - Wind - Base (billion $2018)		0	8.18	17.2	16.7	12	1.18

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)		1.7	4.96	6.17	5.53	5.51	2.59
Capital invested - Wind - Constrained (billion $2018)		6.51	7.43	13.6	12.3	8.59	0.321
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	0.019	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	551	551	551	551	2,764	12,560	14,854
Wind - Base land use assumptions (GWh)	48,113	48,113	71,210	122,262	173,218	211,315	215,061
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	531	1,500	9,235	23,604	38,522	51,191	57,598
Wind - Constrained land use assumptions (GWh)	48,113	49,220	69,807	109,923	151,621	178,536	179,576
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	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	19	19	19	19

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	4	7	9	12
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	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	3,342	1,276	2,536	2,177
Biomass purchases (million $2018/y)		0	0	192	266	412	531

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	11	12.5	16	18.8
Annual - BECCS (MMT)		0	0	4.26	5.9	9.16	11.8
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	6.71	6.64	6.84	7.07
Cumulative - All (MMT)		0	0	11	23.5	39.5	58.3
Cumulative - BECCS (MMT)		0	0	4.26	10.2	19.3	31.1
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	6.71	13.3	20.2	27.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	774	1,136	1,136	1,136	1,136
Spur (km)		0	0	670	988	1,715	2,050
All (km)		0	774	1,805	2,123	2,851	3,186
Cumulative investment - Trunk (million $2018)		0	4,032	5,944	5,944	5,944	5,944
Cumulative investment - Spur (million $2018)		0	0	557	740	1,259	1,462
Cumulative investment - All (million $2018)		0	4,032	6,502	6,684	7,204	7,407

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.1	1.76	3.61	6.02	7.46
Injection wells (wells)		0	1	4	8	13	16
Resource characterization, appraisal, permitting costs (million $2020)		103	251	295	295	295	295
Wells and facilities construction costs (million $2020)		0	35.6	139	247	413	513

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)							-477
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299

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)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-952
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221

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)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409

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)							-18.2
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,381

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)							-131
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,530
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-18.2
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,525
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-262
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,806
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,254
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							225
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,491
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,283
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							450
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,745

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)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		26.7	11.9	5.81	3.05	1.09	0.88
Premature deaths from air pollution - Mobile - On-Road (deaths)		77	78.2	76.7	69.6	55.8	38.5
Premature deaths from air pollution - Gas Stations (deaths)		9.5	9.63	9.36	8.46	6.8	4.78
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		10.1	9.32	8.32	6.83	5.01	3.24
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.145	0.14	0.134	0.121	0.099	0.076
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.67	1.7	1.71	1.57	1.24	0.883

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)		0.888	0.854	0.816	0.774	0.731	0.685
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		7.26	7.24	6.95	6.1	4.8	3.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.49	1.31	1.14	0.985	0.835	0.696
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.692	0.63	0.568	0.506	0.445	0.385
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.986	0.2	0.196	0.188	0.17	0.138
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		172	158	140	124	111	77.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		266	0.238	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		237	105	51.4	27	9.67	7.79
Monetary damages from air pollution - Mobile - On-Road (million $2019)		685	696	682	619	496	343
Monetary damages from air pollution - Gas Stations (million $2019)		84.1	85.3	82.9	74.9	60.3	42.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		89.6	82.6	73.7	60.5	44.4	28.7
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.29	1.24	1.18	1.07	0.875	0.672
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		14.8	15.1	15.1	13.9	11	7.83
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		7.87	7.56	7.22	6.86	6.47	6.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		64.3	64.1	61.5	54	42.5	30.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13.2	11.6	10.1	8.72	7.39	6.17
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		6.13	5.57	5.03	4.48	3.94	3.41
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		8.7	1.77	1.73	1.66	1.5	1.22
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,531	1,406	1,242	1,103	987	690

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		33.4	42.8	918	986	895	566
By economic sector - Construction (jobs)		17,523	24,554	29,060	34,060	45,312	53,637

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		24,391	26,186	26,983	27,201	28,766	29,501
By economic sector - Mining (jobs)		35,028	27,139	20,598	15,688	12,015	7,164
By economic sector - Other (jobs)		1,010	1,550	2,230	3,191	5,106	6,322
By economic sector - Pipeline (jobs)		1,798	2,285	1,803	1,257	1,196	988
By economic sector - Professional (jobs)		15,307	18,488	23,254	28,627	37,046	45,013
By economic sector - Trade (jobs)		13,261	14,048	15,488	17,740	22,143	26,011
By economic sector - Utilities (jobs)		12,983	17,894	21,203	24,764	33,682	42,721
By resource sector - Biomass (jobs)		127	115	3,046	4,146	3,811	2,334
By resource sector - CO2 (jobs)		53.9	6,082	4,253	1,324	2,221	2,903
By resource sector - Coal (jobs)		678	47.7	1.05	0.857	0.617	0.352
By resource sector - Grid (jobs)		13,019	19,934	29,625	39,400	57,101	74,188
By resource sector - Natural Gas (jobs)		34,371	24,979	17,322	13,126	9,668	7,584
By resource sector - Nuclear (jobs)		0	0.004	0.007	0	0	0
By resource sector - Oil (jobs)		52,295	47,370	42,989	38,228	33,358	21,274
By resource sector - Solar (jobs)		3,103	3,778	4,334	5,970	11,451	9,491
By resource sector - Wind (jobs)		17,687	29,880	39,966	51,317	68,552	94,148
By education level - All sectors - High school diploma or less (jobs)		47,372	52,447	56,638	61,345	74,474	84,242
By education level - All sectors - Associates degree or some college (jobs)		35,353	39,560	42,692	46,815	57,807	67,048
By education level - All sectors - Bachelors degree (jobs)		30,208	31,406	32,837	35,112	41,548	46,564
By education level - All sectors - Masters or professional degree (jobs)		7,323	7,635	8,115	8,833	10,616	12,093
By education level - All sectors - Doctoral degree (jobs)		1,078	1,139	1,254	1,408	1,716	1,975
Related work experience - All sectors - None (jobs)		16,542	18,249	19,678	21,423	26,165	29,898
Related work experience - All sectors - Up to 1 year (jobs)		22,226	24,602	26,851	29,408	35,922	40,990
Related work experience - All sectors - 1 to 4 years (jobs)		45,412	49,045	52,232	56,424	68,085	77,164
Related work experience - All sectors - 4 to 10 years (jobs)		28,915	31,509	33,566	36,405	44,210	50,550
Related work experience - All sectors - Over 10 years (jobs)		8,239	8,782	9,208	9,853	11,779	13,320
On-the-Job Training - All sectors - None (jobs)		6,817	7,264	7,720	8,366	10,110	11,453
On-the-Job Training - All sectors - Up to 1 year (jobs)		82,271	88,719	94,869	102,533	123,354	139,446
On-the-Job Training - All sectors - 1 to 4 years (jobs)		24,390	27,087	28,987	31,553	38,751	44,669
On-the-Job Training - All sectors - 4 to 10 years (jobs)		6,657	7,807	8,586	9,594	12,187	14,375
On-the-Job Training - All sectors - Over 10 years (jobs)		1,198	1,308	1,374	1,468	1,759	1,980
On-Site or In-Plant Training - All sectors - None (jobs)		19,719	21,439	23,034	25,077	30,468	34,842
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		74,277	80,170	85,633	92,534	111,452	126,069
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		19,077	21,113	22,585	24,537	30,025	34,444
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		7,380	8,437	9,150	10,101	12,631	14,707
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		880	1,028	1,134	1,264	1,586	1,861
Wage income - All (million $2019)		6,743	7,281	7,777	8,447	10,246	11,700

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	431	408	374	347	327	302	274
Final energy use - Residential (PJ)	177	169	164	158	146	131	118
Final energy use - Commercial (PJ)	121	122	121	120	117	113	111
Final energy use - Industry (PJ)	310	319	325	326	330	327	334

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)		2.54	2.56	3.09	3.17	4.7	4.96

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	15.2	104	193	604	1,015	1,926	2,836
Vehicle stocks - LDV – All others (1000 units)	3,707	3,707	3,707	3,517	3,326	2,563	1,800
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	115	241	815	2,564	3,735
Public EV charging plugs - DC Fast (1000 units)	0.326		0.434		2.29		6.38
Public EV charging plugs - L2 (1000 units)	0.301		10.4		55		154

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 (%)	8.53	15.3	21.1	38.1	64.1	81	86.8
Sales of space heating units - Electric Resistance (%)	24.8	29	27.1	22.1	14.5	9.75	8.07
Sales of space heating units - Gas (%)	60.7	45.8	42.3	32.2	16.6	6.26	2.7
Sales of space heating units - Fossil (%)	5.91	10	9.47	7.6	4.79	3.01	2.4
Sales of water heating units - Electric Heat Pump (%)	0	2	7.69	24.1	49.2	65.6	71.4
Sales of water heating units - Electric Resistance (%)	30.5	42.2	40.8	37	31.1	27.3	25.9
Sales of water heating units - Gas Furnace (%)	68.2	54.6	50.3	37.7	18.4	5.87	1.53
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.21	1.21	1.21	1.2
Sales of cooking units - Electric Resistance (%)	40.2	41.8	47.2	61.7	81.7	94.1	98.4
Sales of cooking units - Gas (%)	59.8	58.2	52.8	38.3	18.3	5.9	1.59
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.16	3.73				

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 (%)	1.94	17.4	23.1	39.7	65.5	83.2	89.8
Sales of space heating units - Electric Resistance (%)	2	4.42	4.46	4.63	5.06	5.73	6.18
Sales of space heating units - Gas (%)	96.1	78.2	72.4	55.7	29.4	11	3.98
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.059	1.96	7.15	22.1	45	59.9	65.1
Sales of water heating units - Electric Resistance (%)	1.74	4.42	6.55	12.7	22.2	28.4	30.5
Sales of water heating units - Gas (%)	97.4	91.9	84.5	63.4	31	9.91	2.58
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	30.1	34.2	39	52	70.1	81.2	85
Sales of cooking units - Gas (%)	69.9	65.8	61	48	29.9	18.8	15
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		14,157	16,435				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,259	350	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,108	9,237	9,237	9,237	5,732	4,811	7,266
Installed thermal - Nuclear (MW)	0	0	0.002	0.004	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-477
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-952
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687

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)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9

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)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409

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)							-18.2
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,381
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-131
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,530
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-18.2
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,525

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)							-262
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,806
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,254
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							225
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,491
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,283
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							450
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,745

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)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		25.4	13.6	3.96	2.69	1.16	0.763
Premature deaths from air pollution - Mobile - On-Road (deaths)		75.8	71.3	54.5	31.6	14.5	5.72
Premature deaths from air pollution - Gas Stations (deaths)		9.32	8.65	6.61	3.98	2.01	1.02
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		10	8.11	5.33	2.87	1.32	0.555
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.142	0.118	0.084	0.051	0.025	0.011
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.65	1.48	1.14	0.747	0.401	0.198
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.888	0.854	0.816	0.774	0.731	0.685
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		7.19	6.21	4.35	2.56	1.43	0.835
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.49	1.21	0.961	0.727	0.521	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.692	0.587	0.485	0.383	0.284	0.189

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)		1.18	0.198	0.188	0.173	0.167	0.105
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		170	162	142	103	63.9	10
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		266	0.238	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		225	120	35.1	23.8	10.3	6.76
Monetary damages from air pollution - Mobile - On-Road (million $2019)		674	634	485	281	129	50.9
Monetary damages from air pollution - Gas Stations (million $2019)		82.5	76.6	58.5	35.3	17.8	9.02
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		88.7	71.8	47.2	25.4	11.7	4.92
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.26	1.05	0.741	0.453	0.222	0.096
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		14.6	13.2	10.1	6.62	3.55	1.76
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		7.87	7.56	7.22	6.86	6.47	6.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		63.6	54.9	38.5	22.7	12.7	7.39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13.2	10.7	8.51	6.44	4.61	3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		6.13	5.2	4.29	3.39	2.51	1.67
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.4	1.75	1.65	1.53	1.48	0.924
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,511	1,436	1,257	912	568	89.2

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		27.6	57.2	464	508	547	567
By economic sector - Construction (jobs)		17,706	23,142	34,254	46,692	65,990	84,643
By economic sector - Manufacturing (jobs)		24,791	28,274	34,281	33,404	36,745	37,475
By economic sector - Mining (jobs)		34,602	27,364	20,232	12,248	6,495	974
By economic sector - Other (jobs)		1,037	1,631	2,923	5,015	8,462	11,025
By economic sector - Pipeline (jobs)		1,759	1,575	1,264	881	519	124
By economic sector - Professional (jobs)		15,464	19,249	27,640	36,887	50,856	67,375
By economic sector - Trade (jobs)		13,282	14,388	17,615	21,474	28,733	37,215
By economic sector - Utilities (jobs)		12,818	15,691	24,822	34,188	51,104	71,964
By resource sector - Biomass (jobs)		107	161	1,249	1,660	2,033	2,496
By resource sector - CO2 (jobs)		0	0.001	0.001	0.001	0.001	0.001
By resource sector - Coal (jobs)		681	47.7	0.968	0.739	0.598	0.146
By resource sector - Grid (jobs)		12,844	20,782	39,843	58,259	91,714	133,345

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Natural Gas (jobs)		33,397	25,989	18,044	12,389	7,779	3,584
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		52,249	47,065	41,182	28,078	17,716	3,524
By resource sector - Solar (jobs)		3,305	5,049	8,035	14,249	26,926	23,666
By resource sector - Wind (jobs)		18,904	32,278	55,138	76,660	103,283	144,748
By education level - All sectors - High school diploma or less (jobs)		47,454	51,917	65,389	76,676	100,268	124,449
By education level - All sectors - Associates degree or some college (jobs)		35,417	39,066	49,888	59,794	79,399	100,390
By education level - All sectors - Bachelors degree (jobs)		30,215	31,541	37,504	42,360	53,689	66,257
By education level - All sectors - Masters or professional degree (jobs)		7,322	7,685	9,276	10,746	13,859	17,433
By education level - All sectors - Doctoral degree (jobs)		1,080	1,162	1,437	1,720	2,237	2,833
Related work experience - All sectors - None (jobs)		16,556	18,023	22,679	26,812	35,291	44,258
Related work experience - All sectors - Up to 1 year (jobs)		22,299	24,572	31,299	37,143	48,921	61,110
Related work experience - All sectors - 1 to 4 years (jobs)		45,443	48,763	60,067	69,708	90,363	112,470
Related work experience - All sectors - 4 to 10 years (jobs)		28,943	31,235	38,775	45,439	59,247	74,201
Related work experience - All sectors - Over 10 years (jobs)		8,247	8,779	10,674	12,195	15,628	19,324
On-the-Job Training - All sectors - None (jobs)		6,826	7,266	8,899	10,377	13,507	16,802
On-the-Job Training - All sectors - Up to 1 year (jobs)		82,386	88,641	109,452	126,651	163,829	203,265
On-the-Job Training - All sectors - 1 to 4 years (jobs)		24,413	26,645	33,613	39,967	52,755	66,491
On-the-Job Training - All sectors - 4 to 10 years (jobs)		6,659	7,514	9,920	12,448	16,987	21,916
On-the-Job Training - All sectors - Over 10 years (jobs)		1,203	1,305	1,610	1,853	2,374	2,889
On-Site or In-Plant Training - All sectors - None (jobs)		19,763	21,404	26,735	31,451	41,099	51,381
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		74,368	79,990	98,777	114,417	148,196	184,034
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		19,096	20,810	26,158	30,934	40,685	51,079
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		7,378	8,165	10,499	12,866	17,275	22,058
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		882	1,003	1,324	1,629	2,196	2,810
Wage income - All (million $2019)		6,740	7,235	8,886	10,324	13,436	16,896

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	431	405	359	302	250	219	207
Final energy use - Residential (PJ)	177	168	153	133	115	105	99.9
Final energy use - Commercial (PJ)	121	122	117	109	103	101	103
Final energy use - Industry (PJ)	310	318	324	323	325	323	330

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)		2.97	3.05	4.83	5.11	4.99	5.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	19.7	322	624	1,681	2,738	3,583	4,428
Vehicle stocks - LDV – All others (1000 units)	3,692	3,516	3,339	2,434	1,528	864	201
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		710	1,819	2,948	4,465	4,860	4,634
Public EV charging plugs - DC Fast (1000 units)	0.326		1.4		6.16		9.97
Public EV charging plugs - L2 (1000 units)	0.301		33.8		148		240

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 (%)	8.53	25.2	76.9	88.5	89	88.9	88.8
Sales of space heating units - Electric Resistance (%)	24.8	26.1	10.9	7.55	7.39	7.53	7.57
Sales of space heating units - Gas (%)	60.7	39.8	8.68	1.75	1.46	1.44	1.43
Sales of space heating units - Fossil (%)	5.91	8.95	3.48	2.25	2.19	2.17	2.16
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.7	72.9	73.4	73.4	73.4
Sales of water heating units - Electric Resistance (%)	30.5	39.9	28.2	25.5	25.4	25.4	25.4
Sales of water heating units - Gas Furnace (%)	68.2	47.2	8.93	0.373	0	0	0
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.2	1.19	1.2	1.2
Sales of cooking units - Electric Resistance (%)	40.4	53.1	92	99.6	100	100	100
Sales of cooking units - Gas (%)	59.6	46.9	8.02	0.404	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.2	3.89				

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 (%)	1.94	26.9	77	91.1	92.3	92.3	92.3
Sales of space heating units - Electric Resistance (%)	2	4.42	4.72	6.04	6.33	6.36	6.38
Sales of space heating units - Gas (%)	96.1	68.7	18.2	2.83	1.38	1.34	1.33
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.059	10.7	56.4	66.5	67	67	66.9
Sales of water heating units - Electric Resistance (%)	1.74	8.05	26.9	31.1	31.3	31.3	31.3
Sales of water heating units - Gas (%)	97.4	79.4	15	0.632	0	0	0
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79
Sales of cooking units - Electric Resistance (%)	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		14,173	16,554				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,259	350	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,108	9,237	9,237	9,237	6,642	11,235	17,738

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)	130	228	333	490	714	1,005	1,384
Installed renewables - Solar - Base land use assumptions (MW)	222	222	222	568	4,930	16,219	24,779
Installed renewables - Wind - Base land use assumptions (MW)	11,527	14,207	21,569	46,636	71,921	101,639	133,466
Installed renewables - Solar - Constrained land use assumptions (MW)	222	3,030	11,278	16,865	29,180	53,652	67,537
Installed renewables - Wind - Constrained land use assumptions (MW)	12,751	15,506	22,260	42,264	62,169	86,004	100,966
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0.381	4.53	11.1	7.93
Capital invested - Wind - Base (billion $2018)		3.94	9.8	31.2	29.9	33.3	33.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	551	551	551	1,289	10,675	34,995	53,523
Wind - Base land use assumptions (GWh)	48,113	58,260	85,647	176,825	266,347	369,711	477,993
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	1,102	13,197	49,056	73,202	125,988	229,674	288,320
Wind - Constrained land use assumptions (GWh)	96,225	116,526	165,926	308,604	444,515	600,153	693,679
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)							-477
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213

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)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-952
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666

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)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409

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)							-18.2
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,381
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-131
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,530
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-18.2
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,525
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-262
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,806
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,254
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							225
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,491
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,283
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							450
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,745

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)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		28.4	12.9	12.8	8.91	3.66	1.62
Premature deaths from air pollution - Mobile - On-Road (deaths)		75.8	71.3	54.5	31.6	14.5	5.72
Premature deaths from air pollution - Gas Stations (deaths)		9.32	8.65	6.61	3.98	2.01	1.02

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)		10	8.11	5.33	2.87	1.32	0.555
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.142	0.118	0.084	0.051	0.025	0.011
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.65	1.48	1.14	0.747	0.401	0.198
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.888	0.854	0.816	0.774	0.731	0.685
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		7.19	6.21	4.35	2.56	1.43	0.835
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.49	1.21	0.961	0.727	0.521	0.339
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.692	0.587	0.485	0.383	0.284	0.189
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.902	0.197	0.188	0.174	0.169	0.104
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		175	170	167	141	118	87.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		266	0.238	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		251	114	114	78.9	32.4	14.4
Monetary damages from air pollution - Mobile - On-Road (million $2019)		674	634	485	281	129	50.9
Monetary damages from air pollution - Gas Stations (million $2019)		82.5	76.6	58.5	35.3	17.8	9.02
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		88.7	71.8	47.2	25.4	11.7	4.92
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.26	1.05	0.741	0.453	0.222	0.096
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		14.6	13.2	10.1	6.62	3.55	1.76
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		7.87	7.56	7.22	6.86	6.47	6.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		63.6	54.9	38.5	22.7	12.7	7.39
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13.2	10.7	8.51	6.44	4.61	3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		6.13	5.2	4.29	3.39	2.51	1.67
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		7.96	1.74	1.66	1.54	1.49	0.922

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)		1,552	1,511	1,486	1,254	1,048	779

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		31.3	44.9	930	794	721	565
By economic sector - Construction (jobs)		17,067	20,907	22,371	22,854	24,660	24,171
By economic sector - Manufacturing (jobs)		22,821	21,403	20,737	18,997	16,272	12,680
By economic sector - Mining (jobs)		35,457	28,650	23,381	16,245	11,439	7,284
By economic sector - Other (jobs)		957	1,150	1,448	1,885	2,464	2,679
By economic sector - Pipeline (jobs)		1,836	2,523	2,166	1,505	1,357	1,175
By economic sector - Professional (jobs)		14,922	15,609	17,819	18,698	19,616	18,925
By economic sector - Trade (jobs)		13,124	12,834	13,141	12,669	12,689	11,894
By economic sector - Utilities (jobs)		13,127	16,376	18,121	18,782	20,096	20,355
By resource sector - Biomass (jobs)		110	115	3,188	2,969	2,824	2,347
By resource sector - CO2 (jobs)		54.2	6,891	4,827	1,480	2,487	3,271
By resource sector - Coal (jobs)		677	47.7	0.972	0.744	0.608	0.145
By resource sector - Grid (jobs)		13,217	15,222	21,563	26,037	29,287	30,503
By resource sector - Natural Gas (jobs)		35,488	29,806	26,500	23,311	18,595	14,155
By resource sector - Nuclear (jobs)		0	0.006	0.015	0	0	0
By resource sector - Oil (jobs)		52,245	47,100	42,254	30,569	23,273	15,837
By resource sector - Solar (jobs)		2,524	2,383	2,402	3,219	5,123	5,265
By resource sector - Wind (jobs)		15,026	17,932	19,379	24,844	27,725	28,348
By education level - All sectors - High school diploma or less (jobs)		46,506	47,164	47,884	44,925	43,810	39,975
By education level - All sectors - Associates degree or some college (jobs)		34,714	35,486	35,771	34,057	33,639	31,159
By education level - All sectors - Bachelors degree (jobs)		29,815	28,813	28,414	25,974	24,658	22,052
By education level - All sectors - Masters or professional degree (jobs)		7,242	7,001	6,988	6,471	6,226	5,643
By education level - All sectors - Doctoral degree (jobs)		1,065	1,032	1,057	1,002	981	898
Related work experience - All sectors - None (jobs)		16,278	16,509	16,728	15,748	15,426	14,167
Related work experience - All sectors - Up to 1 year (jobs)		21,751	21,842	22,254	21,066	20,649	18,921
Related work experience - All sectors - 1 to 4 years (jobs)		44,738	44,598	44,697	41,603	40,258	36,583
Related work experience - All sectors - 4 to 10 years (jobs)		28,471	28,575	28,560	26,727	26,006	23,772
Related work experience - All sectors - Over 10 years (jobs)		8,104	7,973	7,874	7,284	6,974	6,283
On-the-Job Training - All sectors - None (jobs)		6,707	6,571	6,537	6,073	5,880	5,342
On-the-Job Training - All sectors - Up to 1 year (jobs)		80,873	80,196	80,648	75,144	72,549	65,722
On-the-Job Training - All sectors - 1 to 4 years (jobs)		24,012	24,501	24,558	23,156	22,756	20,995
On-the-Job Training - All sectors - 4 to 10 years (jobs)		6,580	7,065	7,230	6,998	7,112	6,753
On-the-Job Training - All sectors - Over 10 years (jobs)		1,169	1,165	1,141	1,057	1,017	915
On-Site or In-Plant Training - All sectors - None (jobs)		19,356	19,250	19,328	18,137	17,659	16,128
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		73,044	72,534	72,874	67,906	65,616	59,502

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)		18,776	19,098	19,157	18,019	17,654	16,233
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		7,301	7,694	7,807	7,448	7,460	6,994
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		865	921	948	920	925	870
Wage income - All (million $2019)		6,659	6,683	6,752	6,317	6,149	5,631

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	431	405	359	302	250	219	207
Final energy use - Residential (PJ)	177	168	153	133	115	105	99.9
Final energy use - Commercial (PJ)	121	122	117	109	103	101	103
Final energy use - Industry (PJ)	310	318	324	323	325	323	330

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)		2.97	3.05	4.83	5.11	4.99	5.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	19.7	322	624	1,681	2,738	3,583	4,428
Vehicle stocks - LDV – All others (1000 units)	3,692	3,516	3,339	2,434	1,528	864	201
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		710	1,819	2,948	4,465	4,860	4,634
Public EV charging plugs - DC Fast (1000 units)	0.326		1.4		6.16		9.97
Public EV charging plugs - L2 (1000 units)	0.301		33.8		148		240

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 (%)	8.53	25.2	76.9	88.5	89	88.9	88.8
Sales of space heating units - Electric Resistance (%)	24.8	26.1	10.9	7.55	7.39	7.53	7.57
Sales of space heating units - Gas (%)	60.7	39.8	8.68	1.75	1.46	1.44	1.43
Sales of space heating units - Fossil (%)	5.91	8.95	3.48	2.25	2.19	2.17	2.16
Sales of water heating units - Electric Heat Pump (%)	0	11.6	61.7	72.9	73.4	73.4	73.4
Sales of water heating units - Electric Resistance (%)	30.5	39.9	28.2	25.5	25.4	25.4	25.4
Sales of water heating units - Gas Furnace (%)	68.2	47.2	8.93	0.373	0	0	0
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.2	1.19	1.2	1.2
Sales of cooking units - Electric Resistance (%)	40.4	53.1	92	99.6	100	100	100
Sales of cooking units - Gas (%)	59.6	46.9	8.02	0.404	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.2	3.89				

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 (%)	1.94	26.9	77	91.1	92.3	92.3	92.3
Sales of space heating units - Electric Resistance (%)	2	4.42	4.72	6.04	6.33	6.36	6.38
Sales of space heating units - Gas (%)	96.1	68.7	18.2	2.83	1.38	1.34	1.33
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.059	10.7	56.4	66.5	67	67	66.9
Sales of water heating units - Electric Resistance (%)	1.74	8.05	26.9	31.1	31.3	31.3	31.3
Sales of water heating units - Gas (%)	97.4	79.4	15	0.632	0	0	0
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79
Sales of cooking units - Electric Resistance (%)	30.1	44.4	79.2	86.1	86.5	86.5	86.5
Sales of cooking units - Gas (%)	69.9	55.6	20.8	13.9	13.5	13.5	13.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		14,173	16,554				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,259	350	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,108	9,237	12,322	12,322	10,631	8,242	9,997
Installed thermal - Nuclear (MW)	0	0	0.002	0.008	0	0	0
Installed renewables - Rooftop PV (MW)	130	228	333	490	714	1,005	1,384
Installed renewables - Solar - Base land use assumptions (MW)	222	222	222	222	856	3,556	5,128
Installed renewables - Wind - Base land use assumptions (MW)	11,727	11,763	11,763	18,176	27,190	31,711	31,711
Installed renewables - Solar - Constrained land use assumptions (MW)	222	3,925	9,886	14,271	19,665	27,598	33,906
Installed renewables - Wind - Constrained land use assumptions (MW)	11,527	11,527	11,868	17,664	24,882	28,195	28,278
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0.659	2.65	1.08
Capital invested - Wind - Base (billion $2018)		0	0	7.96	10.5	4.98	0
Capital invested - Solar PV - Constrained (billion $2018)		4.95	7.13	4.83	5.6	7.78	5.84
Capital invested - Wind - Constrained (billion $2018)		0	0.453	7.19	8.53	3.71	0.089

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	551	551	551	551	1,884	7,748	10,295
Wind - Base land use assumptions (GWh)	48,113	48,113	48,113	72,219	105,046	121,255	121,255
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	551	8,560	21,637	31,206	42,932	59,833	73,465
Wind - Constrained land use assumptions (GWh)	48,113	48,113	49,220	70,691	96,785	108,692	108,979
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)							-477
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-952
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321

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)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228

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)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409

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)							-18.2
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,381
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-131
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,530
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-18.2
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,525
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-262
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,806
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							11.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,254
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							225
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							2,491

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)							11.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,283
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							450
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,745

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)		30	0.027	0.026	0.021	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		25.8	11.1	7.52	4.76	2.02	1.12
Premature deaths from air pollution - Mobile - On-Road (deaths)		77	78.2	76.7	69.6	55.8	38.5
Premature deaths from air pollution - Gas Stations (deaths)		9.5	9.63	9.36	8.46	6.8	4.78
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		10.1	9.32	8.32	6.83	5.01	3.24
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.145	0.14	0.134	0.121	0.099	0.076
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.67	1.7	1.71	1.57	1.24	0.883
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.888	0.854	0.816	0.774	0.731	0.685
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		7.26	7.24	6.95	6.1	4.8	3.44
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.49	1.31	1.14	0.985	0.835	0.696
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.692	0.63	0.568	0.506	0.445	0.385
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.03	0.2	0.196	0.189	0.183	0.172
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		172	158	140	124	111	77.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		266	0.238	0.229	0.184	0.119	0.002
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		229	98.6	66.6	42.2	17.9	9.91
Monetary damages from air pollution - Mobile - On-Road (million $2019)		685	696	682	619	496	343
Monetary damages from air pollution - Gas Stations (million $2019)		84.1	85.3	82.9	74.9	60.3	42.4

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)		89.6	82.6	73.7	60.5	44.4	28.7
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.29	1.24	1.18	1.07	0.875	0.672
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		14.8	15.1	15.1	13.9	11	7.83
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		7.87	7.56	7.22	6.86	6.47	6.07
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		64.3	64.1	61.5	54	42.5	30.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13.2	11.6	10.1	8.72	7.39	6.17
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		6.13	5.57	5.03	4.48	3.94	3.41
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		9.12	1.76	1.73	1.67	1.61	1.52
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,531	1,406	1,242	1,103	987	690

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		30.6	319	3,094	3,670	4,490	4,141
By economic sector - Construction (jobs)		17,632	25,025	29,604	30,949	38,286	43,503
By economic sector - Manufacturing (jobs)		24,492	26,457	26,699	24,161	25,977	26,873
By economic sector - Mining (jobs)		34,888	27,090	20,735	15,889	12,105	6,871
By economic sector - Other (jobs)		1,022	1,587	2,253	2,795	4,051	4,975
By economic sector - Pipeline (jobs)		1,784	2,301	1,831	1,281	1,198	964
By economic sector - Professional (jobs)		15,379	19,064	25,831	29,830	37,053	41,343
By economic sector - Trade (jobs)		13,281	14,214	16,092	17,412	20,432	22,059
By economic sector - Utilities (jobs)		13,019	18,254	22,096	23,069	29,463	35,280
By resource sector - Biomass (jobs)		121	860	10,472	15,402	20,778	19,534
By resource sector - CO2 (jobs)		53.8	6,234	4,366	1,389	2,303	2,925
By resource sector - Coal (jobs)		679	47.7	1.05	0.864	0.705	0.568
By resource sector - Grid (jobs)		13,180	20,459	31,087	36,410	49,444	61,255
By resource sector - Natural Gas (jobs)		33,997	24,860	17,724	13,484	9,641	6,560
By resource sector - Nuclear (jobs)		0	0.003	0.006	0	0	0
By resource sector - Oil (jobs)		52,296	47,370	42,989	38,322	33,521	20,506
By resource sector - Solar (jobs)		3,066	3,736	3,798	4,422	7,801	8,979
By resource sector - Wind (jobs)		18,133	30,744	37,797	39,625	49,567	66,250
By education level - All sectors - High school diploma or less (jobs)		47,459	53,378	59,922	60,171	70,098	75,141
By education level - All sectors - Associates degree or some college (jobs)		35,421	40,166	44,114	44,300	52,019	57,180
By education level - All sectors - Bachelors degree (jobs)		30,238	31,848	34,288	34,387	39,144	41,148
By education level - All sectors - Masters or professional degree (jobs)		7,330	7,757	8,562	8,760	10,108	10,743
By education level - All sectors - Doctoral degree (jobs)		1,080	1,162	1,349	1,437	1,686	1,797

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - None (jobs)		16,568	18,560	20,744	20,945	24,483	26,411
Related work experience - All sectors - Up to 1 year (jobs)		22,276	25,072	28,571	29,067	34,203	36,970
Related work experience - All sectors - 1 to 4 years (jobs)		45,475	49,805	54,614	54,755	63,181	67,498
Related work experience - All sectors - 4 to 10 years (jobs)		28,958	31,974	34,811	34,892	40,427	43,615
Related work experience - All sectors - Over 10 years (jobs)		8,250	8,900	9,495	9,397	10,762	11,516
On-the-Job Training - All sectors - None (jobs)		6,827	7,378	8,104	8,201	9,516	10,163
On-the-Job Training - All sectors - Up to 1 year (jobs)		82,398	90,186	99,955	100,626	116,430	124,210
On-the-Job Training - All sectors - 1 to 4 years (jobs)		24,431	27,487	29,904	29,828	34,761	37,933
On-the-Job Training - All sectors - 4 to 10 years (jobs)		6,671	7,934	8,868	9,027	10,775	12,010
On-the-Job Training - All sectors - Over 10 years (jobs)		1,200	1,326	1,404	1,372	1,573	1,692
On-Site or In-Plant Training - All sectors - None (jobs)		19,754	21,805	24,217	24,424	28,421	30,668
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		74,390	81,469	90,034	90,556	104,805	111,913
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		19,108	21,427	23,355	23,304	27,108	29,438
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		7,392	8,565	9,456	9,574	11,293	12,401
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		882	1,045	1,173	1,197	1,428	1,588
Wage income - All (million $2019)		6,750	7,390	8,138	8,240	9,574	10,288

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	431	408	374	347	327	302	274
Final energy use - Residential (PJ)	177	169	164	158	146	131	118
Final energy use - Commercial (PJ)	121	122	121	120	117	113	111
Final energy use - Industry (PJ)	310	319	325	326	330	327	334

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)		2.54	2.56	3.09	3.17	4.7	4.96

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	15.2	104	193	604	1,015	1,926	2,836
Vehicle stocks - LDV – All others (1000 units)	3,707	3,707	3,707	3,517	3,326	2,563	1,800
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	115	241	815	2,564	3,735
Public EV charging plugs - DC Fast (1000 units)	0.326		0.434		2.29		6.38
Public EV charging plugs - L2 (1000 units)	0.301		10.4		55		154

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 (%)	8.53	15.3	21.1	38.1	64.1	81	86.8
Sales of space heating units - Electric Resistance (%)	24.8	29	27.1	22.1	14.5	9.75	8.07
Sales of space heating units - Gas (%)	60.7	45.8	42.3	32.2	16.6	6.26	2.7
Sales of space heating units - Fossil (%)	5.91	10	9.47	7.6	4.79	3.01	2.4
Sales of water heating units - Electric Heat Pump (%)	0	2	7.69	24.1	49.2	65.6	71.4
Sales of water heating units - Electric Resistance (%)	30.5	42.2	40.8	37	31.1	27.3	25.9
Sales of water heating units - Gas Furnace (%)	68.2	54.6	50.3	37.7	18.4	5.87	1.53
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.21	1.21	1.21	1.2
Sales of cooking units - Electric Resistance (%)	40.2	41.8	47.2	61.7	81.7	94.1	98.4
Sales of cooking units - Gas (%)	59.8	58.2	52.8	38.3	18.3	5.9	1.59
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.16	3.73				

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 (%)	1.94	17.4	23.1	39.7	65.5	83.2	89.8
Sales of space heating units - Electric Resistance (%)	2	4.42	4.46	4.63	5.06	5.73	6.18
Sales of space heating units - Gas (%)	96.1	78.2	72.4	55.7	29.4	11	3.98
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.059	1.96	7.15	22.1	45	59.9	65.1
Sales of water heating units - Electric Resistance (%)	1.74	4.42	6.55	12.7	22.2	28.4	30.5
Sales of water heating units - Gas (%)	97.4	91.9	84.5	63.4	31	9.91	2.58
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79
Sales of cooking units - Electric Resistance (%)	30.1	34.2	39	52	70.1	81.2	85
Sales of cooking units - Gas (%)	69.9	65.8	61	48	29.9	18.8	15
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		14,157	16,435				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,259	350	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,067	9,237	9,237	9,237	6,442	3,495	2,870
Installed thermal - Nuclear (MW)	0	0	0.001	0.004	0	0	0
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0.034	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	2.6	1.6	12.5	21.2	5.44

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	2,913	4,709	18,789	42,612	48,723
Biomass w/ccu allam power plant (GWh)	0	0	0	34.2	34.2	34.2	34.2

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	2	3	14	34	39
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	27	39	51	51
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	2	2	2
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1
Conversion capital investment - Cumulative 5-yr (million $2018)		0	2,381	25,955	21,506	29,942	4,994
Biomass purchases (million $2018/y)		0	188	2,532	4,349	6,838	7,232

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	2.89	42.8	69.5	107	113
Annual - BECCS (MMT)		0	2.89	36.1	62.8	99.9	106
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	6.71	6.64	6.84	7.07
Cumulative - All (MMT)		0	2.89	45.7	115	222	335
Cumulative - BECCS (MMT)		0	2.89	39	102	202	307
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	6.71	13.3	20.2	27.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	774	1,136	1,572	1,572	1,572
Spur (km)		0	90.7	1,586	2,740	4,332	4,584
All (km)		0	865	2,722	4,312	5,904	6,156
Cumulative investment - Trunk (million $2018)		0	4,321	6,605	9,304	9,304	9,304
Cumulative investment - Spur (million $2018)		0	69.1	1,512	2,637	4,863	5,259
Cumulative investment - All (million $2018)		0	4,390	8,116	11,940	14,166	14,563

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0.92	4.28	9.51	12.8	13.4
Injection wells (wells)		0	2	9	16	26	33
Resource characterization, appraisal, permitting costs (million $2020)		103	294	380	380	380	380
Wells and facilities construction costs (million $2020)		0	70.4	274	489	817	1,014

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)							-477
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-952
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321

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)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228

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)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409

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)							-560
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,212
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-116
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)							-2,887
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-560
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,205
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-231
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)							-4,996

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)							496
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							2,008
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							199
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							183
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							2,300
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,186
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							496
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,423
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							399
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							183
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							2,300
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							12,800

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)		126	61.6	34.7	27.6	24.2	22.6
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		27.4	24	25.8	18.7	17.3	14.5
Premature deaths from air pollution - Mobile - On-Road (deaths)		77	79.4	81.8	84.7	87.6	90.5
Premature deaths from air pollution - Gas Stations (deaths)		9.47	9.72	9.94	10.2	10.5	10.7
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		9.88	9.07	8.35	7.9	7.75	7.67
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.144	0.128	0.099	0.07	0.047	0.034
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.55	1.52	1.52	1.55	1.58	1.59
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.928	0.935	0.937	0.935	0.932	0.924

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)		7.26	6.98	6.33	5.77	5.7	6.11
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.56	1.54	1.52	1.5	1.49	1.49
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.723	0.747	0.773	0.797	0.823	0.85
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.65	1.75	1.35	1.26	1.2	1.1
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		173	183	187	180	179	167
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,114	546	308	245	215	201
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		242	213	229	166	153	128
Monetary damages from air pollution - Mobile - On-Road (million $2019)		685	706	728	753	779	805
Monetary damages from air pollution - Gas Stations (million $2019)		83.9	86.1	88	90.6	93	95.2
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		87.6	80.4	74	70	68.6	67.9
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1.28	1.13	0.878	0.624	0.419	0.301
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		13.8	13.5	13.5	13.8	14	14.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		8.22	8.27	8.29	8.28	8.25	8.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		64.3	61.8	56	51.1	50.4	54.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		13.8	13.6	13.5	13.3	13.2	13.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		6.4	6.61	6.84	7.06	7.28	7.52
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		23.4	15.4	11.9	11.1	10.6	9.71
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,539	1,621	1,662	1,598	1,589	1,482

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		29	26	25.7	20.9	20.9	22.6
By economic sector - Construction (jobs)		13,824	14,716	16,024	17,573	19,237	19,924
By economic sector - Manufacturing (jobs)		17,943	19,156	19,684	19,980	19,026	17,530
By economic sector - Mining (jobs)		35,521	30,489	25,729	20,682	17,137	13,313

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		631	767	921	1,193	1,449	1,744
By economic sector - Pipeline (jobs)		1,829	1,917	1,954	1,856	1,859	1,781
By economic sector - Professional (jobs)		12,905	13,069	13,478	14,499	15,506	15,736
By economic sector - Trade (jobs)		12,319	11,949	11,769	11,847	12,143	11,973
By economic sector - Utilities (jobs)		11,476	11,269	12,746	13,603	15,426	15,906
By resource sector - Biomass (jobs)		112	105	97.2	86.8	88.9	90.3
By resource sector - CO2 (jobs)		0	0.062	0.078	0.084	0.093	0.099
By resource sector - Coal (jobs)		1,415	794	287	127	51.8	6.35
By resource sector - Grid (jobs)		10,212	10,456	13,182	15,039	18,016	19,903
By resource sector - Natural Gas (jobs)		35,200	34,389	33,754	30,464	29,868	27,557
By resource sector - Nuclear (jobs)		0	0.002	0.005	0.005	0.011	0
By resource sector - Oil (jobs)		52,349	47,485	43,245	38,861	35,297	29,393
By resource sector - Solar (jobs)			1,230	1,762	1,914	2,210	3,454
By resource sector - Wind (jobs)		7,190	8,899	10,002	14,761	16,272	17,526
By education level - All sectors - High school diploma or less (jobs)		41,146	40,298	40,260	40,096	40,486	39,132
By education level - All sectors - Associates degree or some college (jobs)		30,574	29,954	30,042	30,107	30,640	29,824
By education level - All sectors - Bachelors degree (jobs)		27,169	25,893	25,054	24,264	23,932	22,563
By education level - All sectors - Masters or professional degree (jobs)		6,617	6,284	6,072	5,897	5,854	5,555
By education level - All sectors - Doctoral degree (jobs)		970	930	901	889	892	857
Related work experience - All sectors - None (jobs)		14,483	14,134	14,105	14,038	14,219	13,770
Related work experience - All sectors - Up to 1 year (jobs)		19,077	18,594	18,465	18,414	18,545	17,943
Related work experience - All sectors - 1 to 4 years (jobs)		40,201	38,933	38,443	37,898	38,020	36,452
Related work experience - All sectors - 4 to 10 years (jobs)		25,465	24,693	24,439	24,170	24,326	23,392
Related work experience - All sectors - Over 10 years (jobs)		7,250	7,004	6,876	6,733	6,695	6,373
On-the-Job Training - All sectors - None (jobs)		6,017	5,757	5,602	5,480	5,447	5,202
On-the-Job Training - All sectors - Up to 1 year (jobs)		72,294	70,066	69,129	68,174	68,211	65,336
On-the-Job Training - All sectors - 1 to 4 years (jobs)		21,326	20,793	20,754	20,663	20,958	20,303
On-the-Job Training - All sectors - 4 to 10 years (jobs)		5,818	5,746	5,864	5,969	6,228	6,174
On-the-Job Training - All sectors - Over 10 years (jobs)		1,021	995	980	967	960	915
On-Site or In-Plant Training - All sectors - None (jobs)		17,176	16,609	16,353	16,168	16,202	15,572
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		65,331	63,306	62,482	61,614	61,687	59,117
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		16,693	16,280	16,239	16,152	16,353	15,815
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		6,522	6,407	6,477	6,523	6,734	6,608
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		755	756	778	796	828	818
Wage income - All (million $2019)		6,028	5,896	5,873	5,824	5,897	5,701

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	431	408	377	358	359	370	385

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	177	167	164	162	163	166	169
Final energy use - Commercial (PJ)	121	123	124	125	127	132	141
Final energy use - Industry (PJ)	310	325	335	340	350	358	369

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)		2.84	2.89	4.38	4.61	4.42	4.6

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 (%)	5.79	35.1	36.6	38.9	40.5	42.1	44.4
Sales of space heating units - Electric Resistance (%)	25.8	23.1	22.7	22.1	21.2	19.8	17.5
Sales of space heating units - Gas (%)	62.3	35.7	34.6	33	32.4	32.1	32.2
Sales of space heating units - Fossil (%)	6.03	6.01	6.08	6.04	5.95	5.95	5.96
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	30.5	42.6	42.5	42.6	42.5	42.5	42.4
Sales of water heating units - Gas Furnace (%)	68.2	56.1	56.2	56.2	56.3	56.3	56.4
Sales of water heating units - Other (%)	1.38	1.21	1.22	1.22	1.22	1.22	1.22
Sales of cooking units - Electric Resistance (%)	39.7	39.7	39.7	39.7	39.7	39.7	39.7
Sales of cooking units - Gas (%)	60.3	60.3	60.3	60.3	60.3	60.3	60.3
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		3.09	3.21				

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 (%)	1.94	29.6	70.8	79.1	79.5	79.5	79.5
Sales of space heating units - Electric Resistance (%)	2	6.3	12.1	15.9	18.7	19.1	19.2
Sales of space heating units - Gas (%)	96.1	64.1	17.1	5.05	1.83	1.38	1.33
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.059	0.129	0.128	0.129	0.129	0.127	0.127
Sales of water heating units - Electric Resistance (%)	1.74	3.67	3.65	3.65	3.67	3.67	3.68
Sales of water heating units - Gas (%)	97.4	94.4	94.5	94.5	94.4	94.4	94.4
Sales of water heating units - Other (%)	0.794	1.77	1.77	1.77	1.78	1.78	1.79
Sales of cooking units - Electric Resistance (%)	30.1	32.3	32.3	32.3	32.3	32.3	32.3
Sales of cooking units - Gas (%)	69.9	67.7	67.7	67.7	67.7	67.7	67.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		13,857	14,543				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,259	3,093	1,516	350	350	0	0
Installed thermal - Natural gas (MW)	13,026	9,237	10,110	12,548	10,103	12,515	12,981
Installed thermal - Nuclear (MW)	0	0	0.001	0.003	0.005	0.008	0
Installed renewables - Rooftop PV (MW)	130	228	333	490	714	1,005	1,384

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)	8.54	8.54	8.54	8.54	8.54	8.54	8.54
Installed renewables - Wind - Base land use assumptions (MW)	11,763	11,763	11,763	11,763	11,763	16,133	16,133
Installed renewables - Solar - Constrained land use assumptions (MW)	214	214	214	214	214	214	214

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	551	551	551	551	551	551	551
Wind - Base land use assumptions (GWh)	48,113	48,113	48,113	48,113	48,113	64,574	64,574
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)	-3.92		-9.16				-7.43
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.482		-0.805				-0.847
Business-as-usual carbon sink - Total (Mt CO2e/y)	-4.4		-9.97				-8.27

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)							-477
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-281
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-1,783
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-329
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-591
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-482
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-4,866
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-1,451
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,120
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-11,380
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-715
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-984
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-3,213
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-482
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-1,182
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-930

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,299
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-10,302
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,221
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-27,327
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-952
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,687
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-4,643
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-646
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,773
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,378
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-9,732
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-19,153
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,286
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,321
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							77.9
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							214
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							907
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							119
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)							68.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							322
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							94.3
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							666
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,470
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							117

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 - Avoid deforestation (over 30 years) (1000 hectares)							221
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							1,637
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							179
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)							99.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							483
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							682
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,342
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,761
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							156
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							228
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,368
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							238
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)							131
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							643
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							544
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,101
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,409