



## **Net-Zero America - North Carolina data**

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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:

E. Larson, C. Greig, J. Jenkins, E. Mayfield, A. Pascale, C. Zhang, J. Drossman, R. Williams, S. Pacala, R. Socolow, EJ Baik, R. Birdsey, R. Duke, R. Jones, B. Haley, E. Leslie, K. Paustian, and A. Swan, Net-Zero America: Potential Pathways, Infrastructure, and Impacts, Final Report, Princeton University, Princeton, NJ, 29 October 2021. Report available at <https://net-zeroamerica.princeton.edu>.

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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)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		57.1	39.9	23.5	18.2	9.46	3.53
Premature deaths from air pollution - Mobile - On-Road (deaths)		318	302	233	136	62	23.6
Premature deaths from air pollution - Gas Stations (deaths)		25.4	23.6	18	10.6	5.05	2.21
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.5	24.3	16.5	9.24	4.59	2.16
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.35	6.76	4.61	2.71	1.29	0.538
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.62	5.88	4.49	2.99	1.69	0.926
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.58	3.45	3.31	3.15	2.99	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		25.9	23	17	10.7	6.61	4.33
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.2	4.31	3.31	2.35	1.63	1.08
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.18	2.75	2.31	1.84	1.38	0.928
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.78	0.98	0.982	0.976	0.997	0.995
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62.2	58.1	52	40.9	29.8	18.3
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		695	0.948	0.917	0.766	0.544	0.048
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		506	354	208	162	83.8	31.3
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		2,831	2,683	2,069	1,209	552	210
Monetary damages from air pollution - Gas Stations (million \$2019)		225	209	159	94.2	44.8	19.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		262	215	146	81.9	40.6	19.1
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		74	59.9	40.9	24	11.4	4.76
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		58.6	52.1	39.8	26.5	15	8.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		31.7	30.5	29.3	27.9	26.5	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		229	203	150	95	58.5	38.3

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)		46.1	38.2	29.3	20.8	14.4	9.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		28.2	24.4	20.4	16.3	12.2	8.22
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		15.7	8.65	8.67	8.62	8.79	8.78
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		552	516	462	363	265	162

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		197	400	153	119	87.3	1,020
By economic sector - Construction (jobs)		8,442	15,933	20,488	20,962	19,880	20,309
By economic sector - Manufacturing (jobs)		4,707	7,197	7,485	6,903	7,395	7,513
By economic sector - Mining (jobs)		2,824	2,017	1,298	785	442	248
By economic sector - Other (jobs)		726	2,451	3,362	3,584	3,684	4,075
By economic sector - Pipeline (jobs)		624	529	580	306	214	266
By economic sector - Professional (jobs)		4,527	6,935	8,434	9,135	8,857	10,656
By economic sector - Trade (jobs)		3,291	4,801	5,723	6,040	5,940	6,639
By economic sector - Utilities (jobs)		11,805	12,741	17,375	20,151	19,240	19,012
By resource sector - Biomass (jobs)		846	1,104	436	357	318	4,354
By resource sector - CO2 (jobs)		0	0	1,361	15.5	132	1,102
By resource sector - Coal (jobs)		1,272	0	0	0	0	0
By resource sector - Grid (jobs)		12,986	17,375	26,375	33,250	33,078	32,004
By resource sector - Natural Gas (jobs)		6,808	5,312	4,485	4,655	3,135	3,213
By resource sector - Nuclear (jobs)		2,723	2,679	2,637	2,596	2,361	1,857
By resource sector - Oil (jobs)		6,905	5,452	3,846	2,563	1,651	1,037
By resource sector - Solar (jobs)		5,243	20,178	24,646	22,534	21,934	23,251
By resource sector - Wind (jobs)		359	904	1,111	2,012	3,130	2,919
By education level - All sectors - High school diploma or less (jobs)		15,333	22,653	27,755	28,933	27,980	29,749
By education level - All sectors - Associates degree or some college (jobs)		11,603	16,730	20,873	21,997	21,314	22,328
By education level - All sectors - Bachelors degree (jobs)		7,995	10,647	12,701	13,279	12,808	13,687
By education level - All sectors - Masters or professional degree (jobs)		1,946	2,597	3,125	3,310	3,192	3,467
By education level - All sectors - Doctoral degree (jobs)		267	377	443	464	445	507
Related work experience - All sectors - None (jobs)		5,354	7,680	9,473	9,954	9,627	10,260
Related work experience - All sectors - Up to 1 year (jobs)		7,163	10,784	13,135	13,666	13,259	14,268
Related work experience - All sectors - 1 to 4 years (jobs)		13,521	19,007	23,233	24,380	23,557	24,946
Related work experience - All sectors - 4 to 10 years (jobs)		8,765	12,286	15,107	15,855	15,297	16,087
Related work experience - All sectors - Over 10 years (jobs)		2,340	3,246	3,949	4,129	3,998	4,177
On-the-Job Training - All sectors - None (jobs)		2,017	2,925	3,535	3,670	3,549	3,798
On-the-Job Training - All sectors - Up to 1 year (jobs)		24,475	34,706	42,097	44,030	42,655	45,597

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)		7,842	11,217	13,988	14,724	14,205	14,796
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,462	3,627	4,640	4,916	4,708	4,902
On-the-Job Training - All sectors - Over 10 years (jobs)		347	529	636	644	622	646
On-Site or In-Plant Training - All sectors - None (jobs)		5,977	8,636	10,488	10,922	10,569	11,298
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		22,239	31,536	38,357	40,155	38,888	41,446
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,071	8,707	10,824	11,381	10,989	11,471
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,542	3,671	4,652	4,913	4,700	4,901
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		314	453	577	613	592	621
Wage income - All (million \$2019)		2,004	2,778	3,429	3,655	3,570	3,833

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		155	134	102	73.3	50.5	33.8
Oil consumption - Cumulative (million bbls)							3,171
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		451	380	305	229	144	100
Natural gas consumption - Cumulative (tcf)							9,180
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	917	853	749	620	504	431	398
Final energy use - Residential (PJ)	355	335	313	283	260	247	242
Final energy use - Commercial (PJ)	253	254	245	233	223	220	224
Final energy use - Industry (PJ)	343	347	348	344	341	338	339

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)		6.1	6.25	10.2	10.8	10.4	10.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	64.8	734	1,403	3,744	6,086	7,958	9,829
Vehicle stocks - LDV – All others (1000 units)	8,196	7,804	7,412	5,401	3,391	1,918	446
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,572	4,040	6,528	9,896	10,763	10,266
Public EV charging plugs - DC Fast (1000 units)	0.286		3.07		13.3		21.5
Public EV charging plugs - L2 (1000 units)	1.4		73.8		320		517

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 (%)	32.3	47.7	81.1	88.9	89.3	89.3	89.2
Sales of space heating units - Electric Resistance (%)	22.7	22.3	9.54	6.48	6.3	6.42	6.45
Sales of space heating units - Gas (%)	33.5	16.9	4.84	2.03	1.91	1.91	1.9
Sales of space heating units - Fossil (%)	11.5	13.1	4.52	2.55	2.46	2.42	2.41
Sales of water heating units - Electric Heat Pump (%)	0	10	53.3	63.1	63.6	63.6	63.6
Sales of water heating units - Electric Resistance (%)	61.4	68.3	40.5	34.3	34	34	34
Sales of water heating units - Gas Furnace (%)	34.3	18.9	3.74	0.187	0.002	0	0
Sales of water heating units - Other (%)	4.29	2.81	2.47	2.4	2.41	2.42	2.43
Sales of cooking units - Electric Resistance (%)	75.4	80.6	96.7	99.8	100	100	100
Sales of cooking units - Gas (%)	24.6	19.4	3.31	0.167	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.62	7.56				

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 (%)	8.09	27.7	70	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	7.4	8.38	10.5	12.6	13	13	13
Sales of space heating units - Gas (%)	78.4	59.9	18.7	3.71	1.95	1.9	1.9
Sales of space heating units - Fossil (%)	6.11	4.04	0.768	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.257	10.4	53.9	64	64.5	64.5	64.5
Sales of water heating units - Electric Resistance (%)	6.38	10.9	28.3	32.5	32.8	32.8	32.8
Sales of water heating units - Gas (%)	88.8	74.6	14.8	0.738	0.009	0	0
Sales of water heating units - Other (%)	4.56	4.13	3.01	2.74	2.74	2.73	2.73
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		34,334	38,227				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,404	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,350	15,852	15,266	15,875	12,946	13,601	10,080
Installed thermal - Nuclear (MW)	5,395	5,395	5,395	5,395	5,395	4,393	3,392
Installed renewables - Rooftop PV (MW)	299	482	682	972	1,379	1,906	2,581
Installed renewables - Solar - Base land use assumptions (MW)	2,276	2,276	11,893	24,046	32,568	39,572	44,780
Installed renewables - Wind - Base land use assumptions (MW)	208	208	320	320	423	423	423
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	4,197	6,452	6,452
Installed renewables - Solar - Constrained land use assumptions (MW)	1,172	1,764	9,690	22,630	29,355	34,659	43,632
Installed renewables - Wind - Constrained land use assumptions (MW)	208	208	398	398	398	398	398
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	3,912	5,778	5,778

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion \$2018)		0.319	11.5	13.4	8.86	6.87	4.82
Capital invested - Wind - Base (billion \$2018)		0	0.15	0	0.121	0	0
Capital invested - Offshore Wind - Base (billion \$2018)		0	0	0	7.29	3.33	0
Capital invested - Solar PV - Constrained (billion \$2018)		2.3	9.86	12.9	9.89	4.44	3.52
Capital invested - Wind - Constrained (billion \$2018)		0	0.252	0	0	0	0.037
Capital invested - Offshore Wind - Constrained (billion \$2018)		0	0	0	6.79	2.75	0
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0.041
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)	4,358	4,814	23,450	47,034	63,567	77,168	87,246
Wind - Base land use assumptions (GWh)	734	734	1,115	1,115	1,397	1,397	1,397
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	17,825	26,721	26,721
Solar - Constrained land use assumptions (GWh)	1,582	2,734	18,158	43,284	56,333	66,651	83,952
Wind - Constrained land use assumptions (GWh)	734	734	1,305	1,305	1,305	1,305	1,305
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	17,825	26,721	26,721
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	41.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	16
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	0	0	0	14,438
Biomass purchases (million \$2018/y)		0	218	218	218	218	920



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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	0.55	4.91	0.67	24.7
Annual - BECCS (MMT)		0	0	0	0	0	18.5
Annual - NGCC (MMT)		0	0	0.55	4.91	0.67	6.19
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	0.55	5.46	6.13	30.9
Cumulative - BECCS (MMT)		0	0	0	0	0	18.5
Cumulative - NGCC (MMT)		0	0	0.55	5.46	6.13	12.3
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	227	227	227	227
Spur (km)		0	0	15.4	17.9	146	1,455
All (km)		0	0	243	245	374	1,682
Cumulative investment - Trunk (million \$2018)		0	0	1,354	1,354	1,354	1,354
Cumulative investment - Spur (million \$2018)		0	0	9.11	11.6	104	1,250
Cumulative investment - All (million \$2018)		0	0	1,364	1,366	1,458	2,604

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million \$2020)		0	0	0	0	0	0
Wells and facilities construction costs (million \$2020)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-510
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,300
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,926
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-397
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-325
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,331
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,417
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,785

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
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)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792

Table 15: *E+ 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)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
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)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
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)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-207
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-1,569
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-51
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-1,827
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-207
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-2,978
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-102
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-3,287
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							908
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							92.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,723
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							186
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,025

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)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		53.5	35.8	13.7	5.46	1.94	1.03
Premature deaths from air pollution - Mobile - On-Road (deaths)		324	333	329	300	242	167
Premature deaths from air pollution - Gas Stations (deaths)		25.9	26.5	26	23.5	18.8	13.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.8	27.3	24.3	20.1	15.1	10.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.49	8.06	7.64	6.66	5.01	3.24
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.71	6.74	6.69	6.12	4.91	3.55
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.58	3.45	3.31	3.15	2.99	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		26.1	26.2	25.4	22.7	18.3	13.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.22	4.73	4.24	3.64	3.05	2.5
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.18	2.95	2.7	2.44	2.16	1.89
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.73	0.982	0.99	0.989	0.998	0.969
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62	55.4	46.6	39.6	34.4	24.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		695	0.948	0.917	0.766	0.544	0.048
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		474	317	122	48.4	17.2	9.11
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		2,881	2,959	2,922	2,667	2,149	1,488
Monetary damages from air pollution - Gas Stations (million \$2019)		230	235	230	208	167	116
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		264	242	215	178	134	90
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		75.2	71.4	67.7	59	44.4	28.7
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		59.4	59.8	59.3	54.3	43.5	31.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		31.7	30.5	29.3	27.9	26.5	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		231	232	225	201	162	120
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		46.2	41.9	37.5	32.2	27	22.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		28.2	26.1	23.9	21.6	19.2	16.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		15.2	8.67	8.74	8.73	8.81	8.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		551	492	413	352	306	220

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		240	308	117	75.6	68.4	1,020
By economic sector - Construction (jobs)		8,303	16,183	18,000	18,580	20,741	20,900
By economic sector - Manufacturing (jobs)		4,802	7,422	6,393	6,335	8,988	8,487
By economic sector - Mining (jobs)		2,903	2,109	1,554	1,112	757	428
By economic sector - Other (jobs)		723	2,544	2,869	3,158	3,795	4,088
By economic sector - Pipeline (jobs)		627	524	719	371	328	440
By economic sector - Professional (jobs)		4,486	6,916	7,362	8,131	9,174	10,788
By economic sector - Trade (jobs)		3,327	4,941	5,230	5,626	6,347	6,838
By economic sector - Utilities (jobs)		11,389	12,331	15,195	17,214	19,369	19,081
By resource sector - Biomass (jobs)		911	828	390	318	291	4,208
By resource sector - CO2 (jobs)		0	0	2,334	26.5	226	1,890
By resource sector - Coal (jobs)		1,517	124	0	0	0	0
By resource sector - Grid (jobs)		12,375	16,691	20,559	28,199	33,548	31,897
By resource sector - Natural Gas (jobs)		6,442	4,914	4,666	3,633	3,216	3,241
By resource sector - Nuclear (jobs)		2,723	2,679	2,637	2,596	2,166	1,582
By resource sector - Oil (jobs)		6,991	5,875	4,946	3,971	3,024	1,872
By resource sector - Solar (jobs)		5,471	21,224	20,848	19,902	23,023	23,395
By resource sector - Wind (jobs)		369	941	1,060	1,958	4,072	3,984
By education level - All sectors - High school diploma or less (jobs)		15,225	22,782	24,503	25,787	29,672	30,798
By education level - All sectors - Associates degree or some college (jobs)		11,454	16,809	18,405	19,469	22,482	23,065
By education level - All sectors - Bachelors degree (jobs)		7,929	10,704	11,352	11,958	13,592	14,135
By education level - All sectors - Masters or professional degree (jobs)		1,925	2,602	2,782	2,969	3,355	3,555
By education level - All sectors - Doctoral degree (jobs)		265	379	397	420	466	517
Related work experience - All sectors - None (jobs)		5,298	7,712	8,382	8,851	10,173	10,600
Related work experience - All sectors - Up to 1 year (jobs)		7,124	10,859	11,570	12,193	14,060	14,743
Related work experience - All sectors - 1 to 4 years (jobs)		13,397	19,096	20,595	21,757	24,927	25,777
Related work experience - All sectors - 4 to 10 years (jobs)		8,664	12,345	13,395	14,115	16,162	16,623
Related work experience - All sectors - Over 10 years (jobs)		2,317	3,266	3,497	3,687	4,246	4,327
On-the-Job Training - All sectors - None (jobs)		2,003	2,953	3,143	3,297	3,759	3,917
On-the-Job Training - All sectors - Up to 1 year (jobs)		24,299	34,889	37,271	39,361	45,275	47,160
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,736	11,263	12,360	13,041	14,962	15,281
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,416	3,635	4,099	4,326	4,906	5,039
On-the-Job Training - All sectors - Over 10 years (jobs)		345	536	565	578	665	673
On-Site or In-Plant Training - All sectors - None (jobs)		5,928	8,690	9,289	9,748	11,190	11,669
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		22,069	31,703	33,956	35,881	41,251	42,860

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,995	8,747	9,563	10,095	11,592	11,853
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,499	3,681	4,123	4,339	4,912	5,046
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		309	454	507	539	622	642
Wage income - All (million \$2019)		1,983	2,787	3,047	3,265	3,770	3,955

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	918	861	785	722	672	613	544
Final energy use - Residential (PJ)	355	336	326	315	300	282	265
Final energy use - Commercial (PJ)	253	255	252	248	242	237	235
Final energy use - Industry (PJ)	343	348	349	349	350	347	346

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)		5.28	5.33	6.71	6.92	9.8	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV - EV (1000 units)	50.1	247	443	1,354	2,264	4,280	6,295
Vehicle stocks - LDV - All others (1000 units)	8,229	8,229	8,229	7,806	7,382	5,689	3,995
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	256	534	1,808	5,675	8,272
Public EV charging plugs - DC Fast (1000 units)	0.286		0.97		4.96		13.8
Public EV charging plugs - L2 (1000 units)	1.4		23.3		119		331

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 (%)	32.3	41.3	45.1	56.1	73	84	87.9
Sales of space heating units - Electric Resistance (%)	22.7	24.7	23.3	18.9	12.4	8.34	6.89
Sales of space heating units - Gas (%)	33.5	19.2	17.8	13.9	7.91	3.85	2.41
Sales of space heating units - Fossil (%)	11.5	14.8	13.8	11	6.65	3.78	2.79
Sales of water heating units - Electric Heat Pump (%)	0	1.73	6.65	20.8	42.6	56.9	61.8
Sales of water heating units - Electric Resistance (%)	61.4	73.6	70.5	61.3	47.3	38.2	35.1
Sales of water heating units - Gas Furnace (%)	34.3	21.8	20	15.2	7.52	2.43	0.641
Sales of water heating units - Other (%)	4.29	2.87	2.83	2.74	2.59	2.48	2.44
Sales of cooking units - Electric Resistance (%)	75.3	75.9	78.2	84.2	92.5	97.6	99.3
Sales of cooking units - Gas (%)	24.7	24.1	21.8	15.8	7.55	2.44	0.656
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.58	7.45				

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 (%)	8.09	19.7	24.6	38.6	60.7	76.6	82.8
Sales of space heating units - Electric Resistance (%)	7.4	8.06	8.29	9.07	10.5	11.9	12.7
Sales of space heating units - Gas (%)	78.4	67.5	62.8	49.1	27.1	11	4.45
Sales of space heating units - Fossil (%)	6.11	4.68	4.33	3.28	1.62	0.513	0.134
Sales of water heating units - Electric Heat Pump (%)	0.257	2.02	6.97	21.3	43.2	57.6	62.7
Sales of water heating units - Electric Resistance (%)	6.38	7.55	9.45	15.2	24.1	29.9	32
Sales of water heating units - Gas (%)	88.8	86.1	79.3	59.7	29.4	9.53	2.51
Sales of water heating units - Other (%)	4.56	4.35	4.31	3.87	3.3	2.91	2.77
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		34,313	38,231				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,404	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,350	14,798	14,377	10,982	11,863	12,130	8,012
Installed thermal - Nuclear (MW)	5,395	5,395	5,395	5,395	5,395	3,392	3,392

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)							-186
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-510
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,300
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,926
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-397
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-325
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,331
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,417
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,785
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-765



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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
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)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
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)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
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)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

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)							-207

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,569
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-51
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,827
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-207
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,978
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-102
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,287
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							908
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							92.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,723
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							186
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,025

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)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		47.3	39.2	22.3	13.6	3.61	1.04
Premature deaths from air pollution - Mobile - On-Road (deaths)		318	302	233	136	62	23.6
Premature deaths from air pollution - Gas Stations (deaths)		25.4	23.6	18	10.6	5.05	2.21
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.5	24.3	16.5	9.24	4.59	2.16
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.35	6.76	4.61	2.71	1.29	0.538

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.62	5.88	4.49	2.99	1.69	0.926
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.58	3.45	3.31	3.15	2.99	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		25.9	23	17	10.7	6.61	4.33
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.2	4.31	3.31	2.35	1.63	1.08
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.18	2.75	2.31	1.84	1.38	0.928
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.91	0.981	0.982	0.975	0.995	0.937
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		60.9	57	48	34.6	20.4	2.47
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		695	0.948	0.917	0.766	0.544	0.048
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		419	347	198	120	32	9.24
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		2,831	2,683	2,069	1,209	552	210
Monetary damages from air pollution - Gas Stations (million \$2019)		225	209	159	94.2	44.8	19.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		262	215	146	81.9	40.6	19.1
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		74	59.9	40.9	24	11.4	4.76
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		58.6	52.1	39.8	26.5	15	8.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		31.7	30.5	29.3	27.9	26.5	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		229	203	150	95	58.5	38.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		46.1	38.2	29.3	20.8	14.4	9.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		28.2	24.4	20.4	16.3	12.2	8.22
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		16.8	8.65	8.66	8.6	8.78	8.27
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		541	506	426	307	181	21.9

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		198	412	152	97	78.2	1,016
By economic sector - Construction (jobs)		10,857	17,401	26,135	23,192	39,830	31,252
By economic sector - Manufacturing (jobs)		5,545	7,475	11,231	9,378	12,489	15,506
By economic sector - Mining (jobs)		2,801	1,971	1,198	640	289	32
By economic sector - Other (jobs)		1,262	2,741	4,523	3,796	5,791	5,490
By economic sector - Pipeline (jobs)		610	509	358	229	128	45.2
By economic sector - Professional (jobs)		5,234	7,545	10,924	9,970	16,487	15,201
By economic sector - Trade (jobs)		3,794	5,151	7,286	6,484	10,447	9,375
By economic sector - Utilities (jobs)		11,494	13,437	20,870	22,444	45,393	32,269
By resource sector - Biomass (jobs)		772	1,162	410	317	290	4,471
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		1,272	0	0	0	0	0
By resource sector - Grid (jobs)		12,922	19,080	35,999	41,157	92,478	63,339
By resource sector - Natural Gas (jobs)		6,084	4,984	3,893	3,761	2,376	3,652
By resource sector - Nuclear (jobs)		2,723	2,679	2,235	1,150	265	0
By resource sector - Oil (jobs)		6,907	5,377	3,683	2,190	1,092	0.057
By resource sector - Solar (jobs)		10,732	22,277	34,049	23,560	27,723	33,525
By resource sector - Wind (jobs)		384	1,081	2,410	4,097	6,708	5,200
By education level - All sectors - High school diploma or less (jobs)		17,476	24,238	35,493	32,610	56,198	47,285
By education level - All sectors - Associates degree or some college (jobs)		13,079	17,906	26,643	24,792	42,969	35,738
By education level - All sectors - Bachelors degree (jobs)		8,802	11,322	16,048	14,701	24,785	21,180
By education level - All sectors - Masters or professional degree (jobs)		2,137	2,770	3,936	3,633	6,185	5,267
By education level - All sectors - Doctoral degree (jobs)		302	404	559	495	796	716
Related work experience - All sectors - None (jobs)		6,020	8,210	12,050	11,174	19,331	16,210
Related work experience - All sectors - Up to 1 year (jobs)		8,243	11,555	16,887	15,361	26,104	22,428
Related work experience - All sectors - 1 to 4 years (jobs)		15,124	20,294	29,530	27,296	46,972	39,379
Related work experience - All sectors - 4 to 10 years (jobs)		9,799	13,122	19,173	17,757	30,588	25,483
Related work experience - All sectors - Over 10 years (jobs)		2,610	3,459	5,037	4,643	7,939	6,688
On-the-Job Training - All sectors - None (jobs)		2,298	3,129	4,499	4,057	6,787	5,822
On-the-Job Training - All sectors - Up to 1 year (jobs)		27,478	37,044	53,763	49,431	84,460	71,965
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,818	12,002	17,761	16,540	28,802	23,649
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,794	3,901	5,838	5,483	9,717	7,737
On-the-Job Training - All sectors - Over 10 years (jobs)		407	566	817	720	1,167	1,015
On-Site or In-Plant Training - All sectors - None (jobs)		6,778	9,233	13,384	12,190	20,556	17,625
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		24,962	33,666	48,954	45,080	77,254	65,507
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,835	9,315	13,765	12,795	22,246	18,334
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,867	3,940	5,841	5,471	9,645	7,716
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		352	486	734	695	1,232	1,005
Wage income - All (million \$2019)		2,218	2,961	4,332	4,074	7,136	6,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	917	853	749	620	504	431	398
Final energy use - Residential (PJ)	355	335	313	283	260	247	242
Final energy use - Commercial (PJ)	253	254	245	233	223	220	224
Final energy use - Industry (PJ)	343	347	348	344	341	338	339

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)		6.1	6.25	10.2	10.8	10.4	10.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	64.8	734	1,403	3,744	6,086	7,958	9,829
Vehicle stocks - LDV – All others (1000 units)	8,196	7,804	7,412	5,401	3,391	1,918	446
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,572	4,040	6,528	9,896	10,763	10,266
Public EV charging plugs - DC Fast (1000 units)	0.286		3.07		13.3		21.5
Public EV charging plugs - L2 (1000 units)	1.4		73.8		320		517

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 (%)	32.3	47.7	81.1	88.9	89.3	89.3	89.2
Sales of space heating units - Electric Resistance (%)	22.7	22.3	9.54	6.48	6.3	6.42	6.45
Sales of space heating units - Gas (%)	33.5	16.9	4.84	2.03	1.91	1.91	1.9
Sales of space heating units - Fossil (%)	11.5	13.1	4.52	2.55	2.46	2.42	2.41
Sales of water heating units - Electric Heat Pump (%)	0	10	53.3	63.1	63.6	63.6	63.6
Sales of water heating units - Electric Resistance (%)	61.4	68.3	40.5	34.3	34	34	34
Sales of water heating units - Gas Furnace (%)	34.3	18.9	3.74	0.187	0.002	0	0
Sales of water heating units - Other (%)	4.29	2.81	2.47	2.4	2.41	2.42	2.43
Sales of cooking units - Electric Resistance (%)	75.4	80.6	96.7	99.8	100	100	100
Sales of cooking units - Gas (%)	24.6	19.4	3.31	0.167	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.62	7.56				

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 (%)	8.09	27.7	70	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	7.4	8.38	10.5	12.6	13	13	13
Sales of space heating units - Gas (%)	78.4	59.9	18.7	3.71	1.95	1.9	1.9
Sales of space heating units - Fossil (%)	6.11	4.04	0.768	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.257	10.4	53.9	64	64.5	64.5	64.5
Sales of water heating units - Electric Resistance (%)	6.38	10.9	28.3	32.5	32.8	32.8	32.8
Sales of water heating units - Gas (%)	88.8	74.6	14.8	0.738	0.009	0	0
Sales of water heating units - Other (%)	4.56	4.13	3.01	2.74	2.74	2.73	2.73

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		34,334	38,227				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,404	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,350	12,860	14,631	14,029	10,663	11,303	13,669
Installed thermal - Nuclear (MW)	5,395	5,395	5,395	3,392	951	0	0
Installed renewables - Rooftop PV (MW)	299	482	682	972	1,379	1,906	2,581
Installed renewables - Solar - Base land use assumptions (MW)	2,216	5,569	15,724	32,929	39,154	48,464	56,884
Installed renewables - Wind - Base land use assumptions (MW)	208	208	320	384	423	423	423
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	5,570	15,458	54,728	66,260
Installed renewables - Solar - Constrained land use assumptions (MW)	1,858	4,233	14,876	34,972	43,097	55,347	66,394
Installed renewables - Wind - Constrained land use assumptions (MW)	238	238	428	428	428	428	603
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	4,745	6,452	6,452	65,322
Capital invested - Solar PV - Base (billion \$2018)		4.49	12.2	19	6.47	9.14	7.8
Capital invested - Wind - Base (billion \$2018)		0	0.15	0.078	0.046	0	0
Capital invested - Offshore Wind - Base (billion \$2018)		0	0	11.4	17.2	57.9	14.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4,688	11,220	31,035	64,392	76,535	94,582	110,804
Wind - Base land use assumptions (GWh)	734	734	1,115	1,287	1,397	1,397	1,397
OffshoreWind - Base land use assumptions (GWh)	0	0	0	23,197	65,591	228,715	276,814
Solar - Constrained land use assumptions (GWh)	7,980	17,215	58,470	136,511	168,080	215,434	258,069
Wind - Constrained land use assumptions (GWh)	1,469	1,469	2,609	2,609	2,609	2,609	3,714
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	39,833	53,442	53,442	546,001

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)							-186
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-510
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,300
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,926

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-397
Carbon sink potential - Low - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-284
Carbon sink potential - Low - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-325
Carbon sink potential - Low - Restore productivity (1000 tCO <sub>2</sub> e/y)							-1,331
Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-14,417
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-278
Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-1,785
Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115



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 - Improve plantations (1000 hectares)							471
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)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
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)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-207
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-1,569
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-51
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-1,827
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-207
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-2,978
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-102
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-3,287
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							908
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							92.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,723
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							186

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,025

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)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		65.3	51.6	52	39.6	12.1	4.07
Premature deaths from air pollution - Mobile - On-Road (deaths)		318	302	233	136	62	23.6
Premature deaths from air pollution - Gas Stations (deaths)		25.4	23.6	18	10.6	5.05	2.21
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.5	24.3	16.5	9.24	4.59	2.16
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.35	6.76	4.61	2.71	1.29	0.538
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.62	5.88	4.49	2.99	1.69	0.926
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.58	3.45	3.31	3.15	2.99	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		25.9	23	17	10.7	6.61	4.33
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.2	4.31	3.31	2.35	1.63	1.08
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.18	2.75	2.31	1.84	1.38	0.928
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.65	0.979	0.982	0.976	0.997	0.937
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		63.1	61.2	60.4	52.6	44.5	33.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		695	0.948	0.917	0.766	0.544	0.048
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		579	457	461	351	107	36.1
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		2,831	2,683	2,069	1,209	552	210
Monetary damages from air pollution - Gas Stations (million \$2019)		225	209	159	94.2	44.8	19.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		262	215	146	81.9	40.6	19.1
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		74	59.9	40.9	24	11.4	4.76
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		58.6	52.1	39.8	26.5	15	8.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		31.7	30.5	29.3	27.9	26.5	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		229	203	150	95	58.5	38.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		46.1	38.2	29.3	20.8	14.4	9.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		28.2	24.4	20.4	16.3	12.2	8.22
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		14.5	8.64	8.67	8.61	8.8	8.27
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		561	544	536	467	396	299

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		226	323	108	89	82	1,023
By economic sector - Construction (jobs)		7,649	8,839	14,663	14,828	15,183	15,952
By economic sector - Manufacturing (jobs)		4,035	4,261	3,987	3,762	3,972	3,888
By economic sector - Mining (jobs)		2,848	2,054	1,383	886	557	364
By economic sector - Other (jobs)		630	833	1,957	2,239	2,405	2,480
By economic sector - Pipeline (jobs)		639	556	808	410	350	511
By economic sector - Professional (jobs)		4,107	4,300	5,807	6,410	7,166	8,960
By economic sector - Trade (jobs)		3,064	3,051	4,004	4,253	4,525	5,019
By economic sector - Utilities (jobs)		10,695	12,188	15,294	16,461	20,864	23,896
By resource sector - Biomass (jobs)		790	828	370	333	321	4,250
By resource sector - CO2 (jobs)		0	0	2,637	30	256	2,136
By resource sector - Coal (jobs)		1,272	0	0	0	0	0
By resource sector - Grid (jobs)		11,160	14,209	19,931	24,201	25,910	26,370
By resource sector - Natural Gas (jobs)		6,406	7,567	5,699	6,345	5,836	5,808
By resource sector - Nuclear (jobs)		2,723	2,679	2,637	2,596	7,431	9,795
By resource sector - Oil (jobs)		6,904	5,452	3,846	2,563	1,732	1,239
By resource sector - Solar (jobs)		4,230	5,145	12,432	12,674	12,869	11,766
By resource sector - Wind (jobs)		407	524	459	598	748	730
By education level - All sectors - High school diploma or less (jobs)		13,975	15,224	20,385	20,858	22,908	25,810
By education level - All sectors - Associates degree or some college (jobs)		10,529	11,468	15,477	15,967	17,660	19,535
By education level - All sectors - Bachelors degree (jobs)		7,350	7,605	9,490	9,741	11,279	12,935
By education level - All sectors - Masters or professional degree (jobs)		1,790	1,856	2,339	2,437	2,856	3,329
By education level - All sectors - Doctoral degree (jobs)		247	251	321	336	399	484
Related work experience - All sectors - None (jobs)		4,880	5,292	7,043	7,244	8,007	9,037
Related work experience - All sectors - Up to 1 year (jobs)		6,521	7,070	9,480	9,743	10,822	12,340
Related work experience - All sectors - 1 to 4 years (jobs)		12,358	13,211	17,275	17,764	19,891	22,393
Related work experience - All sectors - 4 to 10 years (jobs)		7,997	8,562	11,285	11,586	12,967	14,504

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Over 10 years (jobs)		2,135	2,270	2,927	3,002	3,416	3,818
On-the-Job Training - All sectors - None (jobs)		1,848	1,951	2,577	2,643	3,007	3,422
On-the-Job Training - All sectors - Up to 1 year (jobs)		22,352	23,876	30,978	31,846	35,716	40,598
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,136	7,758	10,473	10,763	11,930	13,183
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,238	2,481	3,526	3,631	3,938	4,325
On-the-Job Training - All sectors - Over 10 years (jobs)		316	338	456	456	511	564
On-Site or In-Plant Training - All sectors - None (jobs)		5,457	5,826	7,673	7,873	8,871	10,075
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		20,306	21,721	28,283	29,080	32,590	36,934
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,526	6,001	8,075	8,299	9,188	10,168
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,318	2,542	3,545	3,638	3,969	4,381
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		284	315	434	449	485	534
Wage income - All (million \$2019)		1,836	1,977	2,583	2,692	3,105	3,581

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	917	853	749	620	504	431	398
Final energy use - Residential (PJ)	355	335	313	283	260	247	242
Final energy use - Commercial (PJ)	253	254	245	233	223	220	224
Final energy use - Industry (PJ)	343	347	348	344	341	338	339

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)		6.1	6.25	10.2	10.8	10.4	10.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	64.8	734	1,403	3,744	6,086	7,958	9,829
Vehicle stocks - LDV – All others (1000 units)	8,196	7,804	7,412	5,401	3,391	1,918	446
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,572	4,040	6,528	9,896	10,763	10,266
Public EV charging plugs - DC Fast (1000 units)	0.286		3.07		13.3		21.5
Public EV charging plugs - L2 (1000 units)	1.4		73.8		320		517

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 (%)	32.3	47.7	81.1	88.9	89.3	89.3	89.2
Sales of space heating units - Electric Resistance (%)	22.7	22.3	9.54	6.48	6.3	6.42	6.45
Sales of space heating units - Gas (%)	33.5	16.9	4.84	2.03	1.91	1.91	1.9
Sales of space heating units - Fossil (%)	11.5	13.1	4.52	2.55	2.46	2.42	2.41

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0	10	53.3	63.1	63.6	63.6	63.6
Sales of water heating units - Electric Resistance (%)	61.4	68.3	40.5	34.3	34	34	34
Sales of water heating units - Gas Furnace (%)	34.3	18.9	3.74	0.187	0.002	0	0
Sales of water heating units - Other (%)	4.29	2.81	2.47	2.4	2.41	2.42	2.43
Sales of cooking units - Electric Resistance (%)	75.4	80.6	96.7	99.8	100	100	100
Sales of cooking units - Gas (%)	24.6	19.4	3.31	0.167	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.62	7.56				

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 (%)	8.09	27.7	70	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	7.4	8.38	10.5	12.6	13	13	13
Sales of space heating units - Gas (%)	78.4	59.9	18.7	3.71	1.95	1.9	1.9
Sales of space heating units - Fossil (%)	6.11	4.04	0.768	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.257	10.4	53.9	64	64.5	64.5	64.5
Sales of water heating units - Electric Resistance (%)	6.38	10.9	28.3	32.5	32.8	32.8	32.8
Sales of water heating units - Gas (%)	88.8	74.6	14.8	0.738	0.009	0	0
Sales of water heating units - Other (%)	4.56	4.13	3.01	2.74	2.74	2.73	2.73
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		34,334	38,227				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,404	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,355	12,874	18,717	19,515	23,643	25,779	20,100
Installed thermal - Nuclear (MW)	5,395	5,395	5,395	5,395	5,395	5,674	7,704
Installed renewables - Rooftop PV (MW)	299	482	682	972	1,379	1,906	2,581
Installed renewables - Solar - Base land use assumptions (MW)	1,766	2,028	2,854	9,781	17,073	22,886	24,481
Installed renewables - Wind - Base land use assumptions (MW)	208	208	208	208	255	255	255
Installed renewables - Solar - Constrained land use assumptions (MW)	1,527	2,385	2,635	8,587	15,222	21,895	21,895
Installed renewables - Wind - Constrained land use assumptions (MW)	208	241	286	286	286	286	286
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0.351	0.989	7.64	7.58	5.7	1.48
Capital invested - Wind - Base (billion \$2018)		0.052	0	0	0.056	0	0
Capital invested - Solar PV - Constrained (billion \$2018)		1.15	0.299	6.56	6.89	6.54	0
Capital invested - Wind - Constrained (billion \$2018)		0.049	0.06	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,833	4,343	5,952	19,453	33,552	44,837	47,907
Wind - Base land use assumptions (GWh)	734	862	862	862	1,013	1,013	1,013
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	3,350	5,000	5,486	17,082	29,911	42,873	42,873
Wind - Constrained land use assumptions (GWh)	734	854	999	999	999	999	999
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)							-186
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-510
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,300
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,926
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-397
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-325
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,331
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,417
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,785
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-10,827

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
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)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
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)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
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)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-207
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-1,569
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-51
Carbon sink potential - Moderate deployment - Total (1000 tCO <sub>2</sub> e/y)							-1,827
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO <sub>2</sub> e/y)							-207
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO <sub>2</sub> e/y)							-2,978
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-102

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-3,287
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							908
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							92.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,723
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							186
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,025

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)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		50.5	34.7	16.2	10.5	5.69	2.42
Premature deaths from air pollution - Mobile - On-Road (deaths)		324	333	329	300	242	167
Premature deaths from air pollution - Gas Stations (deaths)		25.9	26.5	26	23.5	18.8	13.1
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.8	27.3	24.3	20.1	15.1	10.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.49	8.06	7.64	6.66	5.01	3.24
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.71	6.74	6.69	6.12	4.91	3.55
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.58	3.45	3.31	3.15	2.99	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		26.1	26.2	25.4	22.7	18.3	13.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.22	4.73	4.24	3.64	3.05	2.5
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.18	2.95	2.7	2.44	2.16	1.89
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.77	0.982	0.99	0.99	1.01	1

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62	55.4	46.6	39.6	34.4	24.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		695	0.948	0.917	0.766	0.544	0.048
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		448	307	144	92.8	50.4	21.5
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		2,881	2,959	2,922	2,667	2,149	1,488
Monetary damages from air pollution - Gas Stations (million \$2019)		230	235	230	208	167	116
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		264	242	215	178	134	90
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		75.2	71.4	67.7	59	44.4	28.7
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		59.4	59.8	59.3	54.3	43.5	31.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		31.7	30.5	29.3	27.9	26.5	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		231	232	225	201	162	120
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		46.2	41.9	37.5	32.2	27	22.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		28.2	26.1	23.9	21.6	19.2	16.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		15.6	8.67	8.74	8.74	8.91	8.84
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		551	492	413	352	306	220

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		220	481	200	149	124	110
By economic sector - Construction (jobs)		7,879	15,866	16,703	15,271	16,063	17,336
By economic sector - Manufacturing (jobs)		4,649	7,380	5,767	4,874	6,247	6,661
By economic sector - Mining (jobs)		2,843	2,107	1,560	1,163	756	401
By economic sector - Other (jobs)		690	2,505	2,575	2,521	2,853	3,520
By economic sector - Pipeline (jobs)		622	523	732	384	324	433
By economic sector - Professional (jobs)		4,244	6,986	6,889	6,833	7,230	7,814
By economic sector - Trade (jobs)		3,166	4,904	4,878	4,772	5,007	5,494
By economic sector - Utilities (jobs)		10,569	12,002	14,465	14,474	15,426	15,486
By resource sector - Biomass (jobs)		874	1,295	677	625	573	517
By resource sector - CO2 (jobs)		0	0	2,395	27.2	232	1,940
By resource sector - Coal (jobs)		1,272	0	0	0	0	0
By resource sector - Grid (jobs)		11,151	15,645	19,686	22,870	25,871	24,781
By resource sector - Natural Gas (jobs)		6,083	5,345	4,068	3,323	2,730	2,980
By resource sector - Nuclear (jobs)		2,723	2,679	2,637	2,596	2,166	1,582
By resource sector - Oil (jobs)		6,992	5,875	4,946	4,172	3,046	1,753

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		5,410	20,945	18,361	15,477	16,778	20,971
By resource sector - Wind (jobs)		377	969	1,000	1,352	2,634	2,730
By education level - All sectors - High school diploma or less (jobs)		14,416	22,575	22,950	21,431	23,006	24,361
By education level - All sectors - Associates degree or some college (jobs)		10,825	16,586	17,173	16,100	17,374	18,590
By education level - All sectors - Bachelors degree (jobs)		7,553	10,625	10,658	10,052	10,641	11,142
By education level - All sectors - Masters or professional degree (jobs)		1,833	2,588	2,616	2,502	2,640	2,770
By education level - All sectors - Doctoral degree (jobs)		254	380	373	357	370	391
Related work experience - All sectors - None (jobs)		5,015	7,639	7,849	7,363	7,901	8,410
Related work experience - All sectors - Up to 1 year (jobs)		6,756	10,777	10,824	10,128	10,889	11,568
Related work experience - All sectors - 1 to 4 years (jobs)		12,698	18,910	19,294	18,138	19,390	20,503
Related work experience - All sectors - 4 to 10 years (jobs)		8,212	12,202	12,532	11,745	12,558	13,309
Related work experience - All sectors - Over 10 years (jobs)		2,201	3,226	3,271	3,067	3,291	3,465
On-the-Job Training - All sectors - None (jobs)		1,908	2,927	2,940	2,756	2,929	3,109
On-the-Job Training - All sectors - Up to 1 year (jobs)		23,052	34,610	34,925	32,816	35,175	37,156
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,316	11,109	11,549	10,809	11,597	12,345
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,276	3,578	3,829	3,583	3,818	4,097
On-the-Job Training - All sectors - Over 10 years (jobs)		330	530	525	477	512	547
On-Site or In-Plant Training - All sectors - None (jobs)		5,632	8,624	8,685	8,113	8,683	9,243
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		20,929	31,424	31,816	29,907	32,052	33,853
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,672	8,631	8,939	8,371	8,984	9,552
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,358	3,627	3,856	3,605	3,830	4,091
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		291	447	474	445	481	516
Wage income - All (million \$2019)		1,881	2,760	2,861	2,732	2,946	3,137

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	918	861	785	722	672	613	544
Final energy use - Residential (PJ)	355	336	326	315	300	282	265
Final energy use - Commercial (PJ)	253	255	252	248	242	237	235
Final energy use - Industry (PJ)	343	348	349	349	350	347	346

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)		5.28	5.33	6.71	6.92	9.8	10.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	50.1	247	443	1,354	2,264	4,280	6,295
Vehicle stocks - LDV – All others (1000 units)	8,229	8,229	8,229	7,806	7,382	5,689	3,995
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	256	534	1,808	5,675	8,272
Public EV charging plugs - DC Fast (1000 units)	0.286		0.97		4.96		13.8
Public EV charging plugs - L2 (1000 units)	1.4		23.3		119		331

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 (%)	32.3	41.3	45.1	56.1	73	84	87.9
Sales of space heating units - Electric Resistance (%)	22.7	24.7	23.3	18.9	12.4	8.34	6.89
Sales of space heating units - Gas (%)	33.5	19.2	17.8	13.9	7.91	3.85	2.41
Sales of space heating units - Fossil (%)	11.5	14.8	13.8	11	6.65	3.78	2.79
Sales of water heating units - Electric Heat Pump (%)	0	1.73	6.65	20.8	42.6	56.9	61.8
Sales of water heating units - Electric Resistance (%)	61.4	73.6	70.5	61.3	47.3	38.2	35.1
Sales of water heating units - Gas Furnace (%)	34.3	21.8	20	15.2	7.52	2.43	0.641
Sales of water heating units - Other (%)	4.29	2.87	2.83	2.74	2.59	2.48	2.44
Sales of cooking units - Electric Resistance (%)	75.3	75.9	78.2	84.2	92.5	97.6	99.3
Sales of cooking units - Gas (%)	24.7	24.1	21.8	15.8	7.55	2.44	0.656
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.58	7.45				

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 (%)	8.09	19.7	24.6	38.6	60.7	76.6	82.8
Sales of space heating units - Electric Resistance (%)	7.4	8.06	8.29	9.07	10.5	11.9	12.7
Sales of space heating units - Gas (%)	78.4	67.5	62.8	49.1	27.1	11	4.45
Sales of space heating units - Fossil (%)	6.11	4.68	4.33	3.28	1.62	0.513	0.134
Sales of water heating units - Electric Heat Pump (%)	0.257	2.02	6.97	21.3	43.2	57.6	62.7
Sales of water heating units - Electric Resistance (%)	6.38	7.55	9.45	15.2	24.1	29.9	32
Sales of water heating units - Gas (%)	88.8	86.1	79.3	59.7	29.4	9.53	2.51
Sales of water heating units - Other (%)	4.56	4.35	4.31	3.87	3.3	2.91	2.77
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		34,313	38,231				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,404	938	0	0	0	0	0
Installed thermal - Natural gas (MW)	13,350	12,987	11,918	10,946	9,953	8,986	5,440
Installed thermal - Nuclear (MW)	5,395	5,395	5,395	5,395	5,395	3,392	3,392
Capital invested - Biomass power plant (billion \$2018)	0	0.006	0.925	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	0	0	0

Table 57: E-B+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	11.5	1,827	1,827	1,827	1,827	1,827
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		6.65	0	0	0	0	0
Biomass purchases (million \$2018/y)		314	656	656	656	656	656

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	227	227	227	227
Spur (km)		0	0	0	0	0	130
All (km)		0	0	227	227	227	358
Cumulative investment - Trunk (million \$2018)		0	0	1,354	1,354	1,354	1,354
Cumulative investment - Spur (million \$2018)		0	0	0	0	0	105
Cumulative investment - All (million \$2018)		0	0	1,354	1,354	1,354	1,459

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0	0	0	0
Injection wells (wells)		0	0	0	0	0	0
Resource characterization, appraisal, permitting costs (million \$2020)		0	0	0	0	0	0
Wells and facilities construction costs (million \$2020)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-510
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,300
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,926
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-397
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-325
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,331
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,417
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,785
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-17,779

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
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)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
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)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
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)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

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)							-639
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,348
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-43.3
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)							-2,030
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-639
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,559

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO <sub>2</sub> e/y)							-86.7
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO <sub>2</sub> e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO <sub>2</sub> e/y)							-3,285
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							379
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							775
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							78.8
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							104
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							134
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,472
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							379
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,635
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							158
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							104
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							134
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,410

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)		257	168	146	136	132	126
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		44.9	50.3	58.5	57.6	63.5	61.2
Premature deaths from air pollution - Mobile - On-Road (deaths)		323	337	350	364	378	393
Premature deaths from air pollution - Gas Stations (deaths)		25.8	26.8	27.6	28.6	29.6	30.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.3	27.2	25.5	24.7	24.8	24.9
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.16	6.81	4.91	3.28	2.13	1.5
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.33	6.18	6.14	6.25	6.43	6.59
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.74	3.77	3.8	3.81	3.81	3.79
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		26.3	26.2	24.7	23	22.4	23.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.37	5.22	4.98	4.66	4.49	4.43
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.33	3.5	3.68	3.84	4	4.17
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		3.27	2.43	2.08	2.01	1.98	1.9
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62.4	67.4	70.3	68	68.7	66
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		2,277	1,485	1,292	1,205	1,169	1,113
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		397	445	518	510	562	542
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		2,876	2,995	3,110	3,238	3,364	3,495
Monetary damages from air pollution - Gas Stations (million \$2019)		229	237	244	253	262	269
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		260	241	226	219	220	221
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		72.3	60.4	43.5	29.1	18.9	13.3
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		56.1	54.8	54.4	55.3	56.9	58.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		33.1	33.4	33.6	33.7	33.7	33.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		233	232	219	203	198	207
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		47.5	46.2	44.1	41.3	39.8	39.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		29.4	31	32.6	34	35.4	36.9
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		28.9	21.4	18.3	17.7	17.5	16.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		554	599	625	604	610	586

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		209	187	185	150	150	163
By economic sector - Construction (jobs)		5,986	7,301	8,621	8,680	9,612	9,700
By economic sector - Manufacturing (jobs)		2,626	2,783	2,983	3,011	3,107	3,987
By economic sector - Mining (jobs)		2,971	2,396	1,949	1,541	1,310	1,112
By economic sector - Other (jobs)		286	548	730	834	979	1,284
By economic sector - Pipeline (jobs)		638	655	659	627	636	635
By economic sector - Professional (jobs)		3,622	3,661	4,083	4,051	4,326	4,411
By economic sector - Trade (jobs)		2,835	2,805	2,931	2,839	3,013	3,174
By economic sector - Utilities (jobs)		10,653	10,515	12,247	11,917	13,001	11,571
By resource sector - Biomass (jobs)		805	753	699	625	640	650
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		1,716	636	603	218	0	0
By resource sector - Grid (jobs)		11,010	11,949	14,843	13,834	16,116	13,760
By resource sector - Natural Gas (jobs)		6,327	6,309	7,020	7,379	7,633	7,251
By resource sector - Nuclear (jobs)		2,723	2,679	2,637	2,596	2,555	2,324
By resource sector - Oil (jobs)		7,024	5,990	5,263	4,882	4,657	4,503
By resource sector - Solar (jobs)			2,209	2,989	3,693	4,142	6,430
By resource sector - Wind (jobs)		221	325	335	426	391	1,119
By education level - All sectors - High school diploma or less (jobs)		12,144	12,796	14,349	14,045	15,163	15,190
By education level - All sectors - Associates degree or some college (jobs)		9,211	9,609	10,862	10,680	11,529	11,490
By education level - All sectors - Bachelors degree (jobs)		6,623	6,607	7,177	6,977	7,379	7,318
By education level - All sectors - Masters or professional degree (jobs)		1,626	1,618	1,764	1,718	1,820	1,794
By education level - All sectors - Doctoral degree (jobs)		221	221	237	233	244	245
Related work experience - All sectors - None (jobs)		4,297	4,464	5,007	4,911	5,293	5,275
Related work experience - All sectors - Up to 1 year (jobs)		5,606	5,913	6,605	6,470	6,968	7,045
Related work experience - All sectors - 1 to 4 years (jobs)		10,962	11,265	12,518	12,230	13,114	13,040
Related work experience - All sectors - 4 to 10 years (jobs)		7,080	7,283	8,123	7,954	8,529	8,456
Related work experience - All sectors - Over 10 years (jobs)		1,881	1,927	2,135	2,087	2,231	2,220
On-the-Job Training - All sectors - None (jobs)		1,617	1,668	1,832	1,793	1,912	1,928
On-the-Job Training - All sectors - Up to 1 year (jobs)		19,694	20,258	22,447	21,916	23,478	23,493
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,277	6,547	7,389	7,257	7,829	7,747
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,974	2,098	2,409	2,379	2,588	2,533
On-the-Job Training - All sectors - Over 10 years (jobs)		264	280	311	307	328	336
On-Site or In-Plant Training - All sectors - None (jobs)		4,756	4,914	5,452	5,344	5,715	5,746
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		17,908	18,445	20,464	19,982	21,424	21,406

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,856	5,066	5,708	5,601	6,042	5,991
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,056	2,163	2,464	2,427	2,630	2,574
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		249	263	302	298	324	320
Wage income - All (million \$2019)		1,646	1,699	1,906	1,885	2,044	2,044

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	917	863	796	756	756	778	806
Final energy use - Residential (PJ)	355	338	334	334	339	348	357
Final energy use - Commercial (PJ)	253	258	261	264	267	276	291
Final energy use - Industry (PJ)	344	359	375	389	406	422	442

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)		6.29	6.46	8.19	8.55	7.99	8.24

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 (%)	30.3	53.9	54.7	55.8	56.8	58.1	60.1
Sales of space heating units - Electric Resistance (%)	23.3	20.2	19.9	19.3	18.5	17.3	15.2
Sales of space heating units - Gas (%)	34.5	15.8	18.1	18.8	18.7	18.7	18.7
Sales of space heating units - Fossil (%)	11.8	10.1	7.34	6.13	5.97	5.93	5.99
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	61.4	74.7	74.8	74.6	74.5	74.5	74.4
Sales of water heating units - Gas Furnace (%)	34.3	22.4	22.4	22.5	22.6	22.6	22.7
Sales of water heating units - Other (%)	4.29	2.88	2.88	2.9	2.93	2.93	2.94
Sales of cooking units - Electric Resistance (%)	75.1	75.1	75.1	75.1	75.1	75.1	75.1
Sales of cooking units - Gas (%)	24.9	24.9	24.9	24.9	24.9	24.9	24.9
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		7.46	6.79				

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 (%)	8.09	26.8	56.4	70.2	72	72.2	72.3
Sales of space heating units - Electric Resistance (%)	7.4	9.19	13.8	20.2	25.1	25.8	25.8
Sales of space heating units - Gas (%)	78.4	59.6	26.8	8.28	2.71	1.96	1.9
Sales of space heating units - Fossil (%)	6.11	4.41	2.99	1.35	0.201	0.017	0
Sales of water heating units - Electric Heat Pump (%)	0.257	0.277	0.272	0.274	0.275	0.273	0.274
Sales of water heating units - Electric Resistance (%)	6.38	6.85	6.76	6.78	6.8	6.76	6.77
Sales of water heating units - Gas (%)	88.8	88.5	88.5	88.5	88.5	88.5	88.5
Sales of water heating units - Other (%)	4.56	4.4	4.5	4.42	4.47	4.48	4.45

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		33,829	35,143				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	9,404	1,701	1,701	1,701	0	0	0
Installed thermal - Natural gas (MW)	13,350	12,970	14,522	17,680	16,474	23,767	18,424
Installed thermal - Nuclear (MW)	5,395	5,395	5,395	5,395	5,395	5,395	4,393
Installed renewables - Rooftop PV (MW)	299	482	682	972	1,379	1,906	2,581
Installed renewables - Solar - Base land use assumptions (MW)	1,508	1,508	1,508	1,508	1,508	1,508	1,508
Installed renewables - Wind - Base land use assumptions (MW)	208	208	208	208	255	255	285
Installed renewables - Solar - Constrained land use assumptions (MW)	5.98	5.98	5.98	5.98	5.98	5.98	5.98

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,350	3,350	3,350	3,350	3,350	3,350	3,350
Wind - Base land use assumptions (GWh)	734	734	862	862	1,013	1,013	1,115
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)	-30.9		-14.5				-11.7
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-4.84		-8.07				-8.49
Business-as-usual carbon sink - Total (Mt CO2e/y)	-35.8		-22.6				-20.2

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)							-186
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-510
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,300
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,926
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-397
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-325
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,331

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-14,417
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-278
Carbon sink potential - Mid - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-1,785
Carbon sink potential - Mid - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO <sub>2</sub> e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO <sub>2</sub> e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO <sub>2</sub> e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO <sub>2</sub> e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO <sub>2</sub> e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO <sub>2</sub> e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO <sub>2</sub> e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO <sub>2</sub> e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO <sub>2</sub> e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO <sub>2</sub> e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO <sub>2</sub> e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO <sub>2</sub> e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
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)							56.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
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)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
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)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122



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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513