



Net-Zero America - Iowa data

October 29, 2021 (updated January 9, 2022)

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		32.4	0.025	0.023	0.019	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		11.2	6.23	2.9	2	1.29	0.62
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.2	36.1	27.1	15.5	6.99	2.75
Premature deaths from air pollution - Gas Stations (deaths)		3.42	3.11	2.34	1.39	0.686	0.339
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.07	6.83	4.8	2.74	1.33	0.519
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.441	0.359	0.246	0.143	0.061	0.021
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.5	2.38	1.91	1.28	0.658	0.247
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.65	3.47	3.28	3.08	2.88	2.67
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.92	5.17	3.91	2.51	1.44	0.724
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.844	0.654	0.476	0.328	0.207
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.556	0.46	0.37	0.285	0.207	0.135
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.557	0.13	0.124	0.116	0.112	0.109
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.8	44.4	39.9	30.8	22.6	13.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		287	0.217	0.207	0.172	0.115	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		98.9	55.2	25.7	17.7	11.4	5.49
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		349	321	241	137	62.1	24.5
Monetary damages from air pollution - Gas Stations (million \$2019)		30.3	27.6	20.7	12.3	6.08	3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		71.5	60.6	42.5	24.3	11.8	4.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		3.91	3.18	2.18	1.27	0.54	0.182
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		22.1	21.1	17	11.3	5.83	2.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		32.3	30.7	29	27.2	25.5	23.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		52.4	45.8	34.6	22.3	12.7	6.41

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)		9.2	7.47	5.79	4.21	2.9	1.83
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		4.93	4.07	3.28	2.53	1.83	1.19
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		4.91	1.15	1.1	1.02	0.992	0.962
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		425	394	355	273	201	124

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		6,919	6,945	6,697	3,630	2,029	3,643
By economic sector - Construction (jobs)		13,022	21,457	26,723	34,589	41,941	59,355
By economic sector - Manufacturing (jobs)		7,390	8,075	9,085	7,897	7,420	10,929
By economic sector - Mining (jobs)		1,793	1,250	880	600	399	273
By economic sector - Other (jobs)		1,081	2,009	2,699	4,030	5,052	8,320
By economic sector - Pipeline (jobs)		418	869	411	239	206	316
By economic sector - Professional (jobs)		9,005	13,586	18,944	24,994	32,662	47,555
By economic sector - Trade (jobs)		6,868	8,745	11,118	13,831	17,119	25,145
By economic sector - Utilities (jobs)		10,812	16,115	20,693	26,562	34,547	49,727
By resource sector - Biomass (jobs)		16,205	15,818	14,909	8,483	7,722	16,690
By resource sector - CO2 (jobs)		0	4,129	939	52.6	326	1,578
By resource sector - Coal (jobs)		1,406	317	0	0	0	0
By resource sector - Grid (jobs)		16,331	23,045	35,054	47,268	62,451	91,573
By resource sector - Natural Gas (jobs)		3,506	3,071	2,722	2,297	2,336	2,111
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		3,740	3,174	2,517	1,961	1,552	1,239
By resource sector - Solar (jobs)		1,627	4,704	4,101	7,500	7,732	18,668
By resource sector - Wind (jobs)		14,494	24,794	37,008	48,808	59,255	73,404
By education level - All sectors - High school diploma or less (jobs)		27,084	35,934	42,740	48,532	57,051	83,156
By education level - All sectors - Associates degree or some college (jobs)		16,085	23,329	29,278	36,473	45,076	65,183
By education level - All sectors - Bachelors degree (jobs)		10,921	15,220	19,304	23,912	29,840	43,266
By education level - All sectors - Masters or professional degree (jobs)		2,791	3,946	5,102	6,395	8,054	11,694
By education level - All sectors - Doctoral degree (jobs)		429	622	827	1,059	1,353	1,964
Related work experience - All sectors - None (jobs)		8,793	11,926	14,426	16,892	20,296	29,589
Related work experience - All sectors - Up to 1 year (jobs)		13,939	18,208	21,645	24,162	28,030	40,927
Related work experience - All sectors - 1 to 4 years (jobs)		19,337	27,106	33,775	41,324	50,989	74,035
Related work experience - All sectors - 4 to 10 years (jobs)		12,069	17,331	21,779	27,073	33,543	48,424
Related work experience - All sectors - Over 10 years (jobs)		3,170	4,480	5,625	6,920	8,515	12,288
On-the-Job Training - All sectors - None (jobs)		3,233	4,387	5,368	6,375	7,686	11,215
On-the-Job Training - All sectors - Up to 1 year (jobs)		39,670	53,327	65,084	76,297	91,947	134,005

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)		10,522	15,444	19,400	24,316	30,121	43,385
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,378	5,171	6,518	8,324	10,360	14,855
On-the-Job Training - All sectors - Over 10 years (jobs)		506	722	881	1,059	1,260	1,803
On-Site or In-Plant Training - All sectors - None (jobs)		9,133	12,715	15,750	19,030	23,278	33,822
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		35,775	48,219	58,863	69,142	83,303	121,322
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		8,392	12,127	15,139	18,763	23,119	33,368
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,515	5,283	6,624	8,375	10,387	14,897
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		494	707	874	1,060	1,287	1,854
Wage income - All (million \$2019)		2,984	4,210	5,295	6,496	8,064	11,837

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		84.1	77.8	66.8	56.1	47.5	40.4
Oil consumption - Cumulative (million bbls)							2,036
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		343	289	232	175	110	76.2
Natural gas consumption - Cumulative (tcf)							6,984
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)	288	269	235	195	158	136	127
Final energy use - Residential (PJ)	158	149	141	125	107	92.3	82.5
Final energy use - Commercial (PJ)	119	116	111	104	96.2	90.2	86.6
Final energy use - Industry (PJ)	698	727	740	738	743	749	755

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)		3.02	3.15	5.47	5.86	5.07	5.32

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	8.7	311	613	1,671	2,729	3,574	4,420
Vehicle stocks - LDV – All others (1000 units)	3,685	3,509	3,333	2,429	1,525	863	201
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		710	1,814	2,950	4,464	4,863	4,634
Public EV charging plugs - DC Fast (1000 units)	0.103		1.41		6.29		10.2
Public EV charging plugs - L2 (1000 units)	0.26		34		151		245

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 (%)	4.32	9.3	34.2	83.1	91.9	92.5	92.3
Sales of space heating units - Electric Resistance (%)	10.7	14.9	11.7	5.07	3.86	3.82	4.03
Sales of space heating units - Gas (%)	74.1	58.4	41.4	7.68	1.69	1.31	1.28
Sales of space heating units - Fossil (%)	10.9	17.4	12.6	4.14	2.53	2.35	2.41
Sales of water heating units - Electric Heat Pump (%)	0	0.81	11.1	33.7	37.7	37.9	37.9
Sales of water heating units - Electric Resistance (%)	25.3	40.6	46.5	59.5	61.9	62.1	62
Sales of water heating units - Gas Furnace (%)	74.7	58.5	42.4	6.78	0.4	0	0
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.025	0.025	0.025
Sales of cooking units - Electric Resistance (%)	62.2	70.3	94.9	99.7	100	100	100
Sales of cooking units - Gas (%)	37.8	29.7	5.08	0.256	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.73	3.43				

Table 8: E+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.46	7.62	30.1	77.9	86.5	87	87
Sales of space heating units - Electric Resistance (%)	4.11	5.76	8.25	11.9	12.5	12.5	12.5
Sales of space heating units - Gas Furnace (%)	90.9	84.7	61.3	10.2	1.03	0.455	0.455
Sales of space heating units - Fossil (%)	2.55	1.96	0.38	0.016	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.634	1.83	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	5.5	7.95	20.3	47	51.7	52	52
Sales of water heating units - Gas Furnace (%)	93	89.3	64.5	10.3	0.611	0	0
Sales of water heating units - Other (%)	0.862	0.936	0.728	0.68	0.676	0.678	0.678
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		9,055	9,857				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,784	2,387	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,462	3,410	4,152	4,329	5,529	7,179	10,985
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	173	309	395	526	699	901	1,141
Installed renewables - Solar - Base land use assumptions (MW)	91.5	245	2,859	4,309	8,344	12,130	25,263
Installed renewables - Wind - Base land use assumptions (MW)	9,337	14,730	21,255	40,083	60,583	93,622	143,661
Installed renewables - Solar - Constrained land use assumptions (MW)	85.4	806	4,707	7,166	9,645	14,276	29,369
Installed renewables - Wind - Constrained land use assumptions (MW)	10,744	16,625	25,721	39,833	52,787	58,822	60,338
Capital invested - Solar PV - Base (billion \$2018)		0.206	3.13	1.6	4.19	3.71	12.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion \$2018)		5.86	8.69	23.4	24.2	37	53
Capital invested - Solar PV - Constrained (billion \$2018)		1.52	5.68	4.23	7.07	2.88	9.72
Capital invested - Wind - Constrained (billion \$2018)		13.8	10.4	16.5	14.7	6.29	1.17
Capital invested - Biomass power plant (billion \$2018)	0	0.005	0.145	0	0	0	0
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 10: E+ scenario - PILLAR 2: Clean Electricity - Generation

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	195	486	5,419	8,152	15,708	22,773	47,178
Wind - Base land use assumptions (GWh)	41,883	55,716	78,202	142,280	210,951	320,274	482,424
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	182	1,543	8,890	13,536	18,197	26,844	54,921
Wind - Constrained land use assumptions (GWh)	41,883	61,841	92,114	137,870	178,181	196,403	200,810
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	9.49	295	295	295	295	295
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 11: E+ 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	19	31
Number of facilities - Diesel (quantity)	0	0	0	1	1	2	2
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	2	2
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	28
Number of facilities - Sng (quantity)	0	1	1	1	1	2	2
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		5.45	162	25.9	0.269	17,934	48,036
Biomass purchases (million \$2018/y)		131	247	249	249	1,542	3,892

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.25	3.35	3.32	26.5	58
Annual - BECCS (MMT)		0	0	0	0	23	54.5
Annual - NGCC (MMT)		0	0.01	0	0	0	0
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	3.25	6.6	9.92	36.4	94.4
Cumulative - BECCS (MMT)		0	0	0	0	23	77.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - NGCC (MMT)		0	0.01	0.01	0.01	0.01	0.01
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	13.3	16.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	617	790	790	790	790
Spur (km)		0	47	167	96.9	1,192	3,474
All (km)		0	664	957	887	1,982	4,263
Cumulative investment - Trunk (million \$2018)		0	4,153	5,051	5,051	5,051	5,051
Cumulative investment - Spur (million \$2018)		0	39.1	157	122	1,313	3,488
Cumulative investment - All (million \$2018)		0	4,192	5,208	5,173	6,364	8,539

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	0.01	0.01	0.01	0.01	0.01
Wells and facilities construction costs (million \$2020)		0	0	0.01	0.01	0.02	0.02

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)							-65.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-131
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
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)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-4,209

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,458
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-236
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-11,904
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-4,209
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-14,138
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-472
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-18,820
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,113
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							429
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,638
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,797
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							859
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,751

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)		32.4	0.025	0.023	0.019	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		11.1	5.39	2.19	1.01	0.408	0.329
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.8	39.6	38.1	34	26.9	18.3
Premature deaths from air pollution - Gas Stations (deaths)		3.48	3.47	3.32	2.96	2.35	1.63
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.11	7.34	6.54	5.55	4.36	3.09
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.449	0.431	0.413	0.371	0.298	0.223

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.51	2.55	2.56	2.42	2	1.49
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.65	3.47	3.28	3.08	2.88	2.67
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.94	5.64	5.27	4.67	3.85	2.95
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.919	0.808	0.687	0.569	0.462
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.556	0.493	0.434	0.377	0.324	0.275
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.529	0.132	0.128	0.122	0.113	0.097
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.7	42.8	36.8	31.9	28	19.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		287	0.217	0.207	0.172	0.115	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		98.5	47.8	19.4	8.98	3.62	2.91
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		354	352	339	303	239	163
Monetary damages from air pollution - Gas Stations (million \$2019)		30.9	30.7	29.4	26.2	20.8	14.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		71.8	65.1	57.9	49.2	38.6	27.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		3.98	3.82	3.66	3.28	2.64	1.97
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		22.3	22.6	22.7	21.4	17.8	13.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		32.3	30.7	29	27.2	25.5	23.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		52.6	49.9	46.6	41.3	34.1	26.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.22	8.14	7.15	6.08	5.04	4.09
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		4.93	4.37	3.85	3.34	2.87	2.43
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		4.67	1.16	1.13	1.08	0.997	0.852
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		424	380	327	283	249	172

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		6,920	6,999	6,713	3,642	2,629	3,641
By economic sector - Construction (jobs)		13,232	23,043	25,467	33,220	46,961	69,136
By economic sector - Manufacturing (jobs)		7,471	8,179	8,644	7,737	9,195	12,713
By economic sector - Mining (jobs)		1,840	1,273	967	734	542	377
By economic sector - Other (jobs)		1,100	2,070	2,542	3,817	5,566	9,427
By economic sector - Pipeline (jobs)		419	1,220	490	268	287	502
By economic sector - Professional (jobs)		9,181	14,015	18,161	24,205	37,387	55,360
By economic sector - Trade (jobs)		6,989	8,955	10,769	13,468	19,401	29,479
By economic sector - Utilities (jobs)		10,935	17,495	19,150	25,427	39,221	58,053
By resource sector - Biomass (jobs)		16,207	15,961	14,974	8,556	11,185	16,163
By resource sector - CO2 (jobs)		0	7,079	1,611	90.2	558	2,706
By resource sector - Coal (jobs)		1,588	409	0	0	0	0
By resource sector - Grid (jobs)		16,435	22,984	31,686	44,695	70,805	106,412
By resource sector - Natural Gas (jobs)		3,504	2,788	2,270	2,570	2,799	2,130
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		3,769	3,335	2,944	2,546	2,137	1,700
By resource sector - Solar (jobs)		1,665	4,930	3,591	6,599	8,252	19,046
By resource sector - Wind (jobs)		14,919	25,763	35,828	47,461	65,451	90,531
By education level - All sectors - High school diploma or less (jobs)		27,402	37,738	40,956	46,947	65,150	96,330
By education level - All sectors - Associates degree or some college (jobs)		16,329	24,753	27,834	35,184	51,178	76,007
By education level - All sectors - Bachelors degree (jobs)		11,089	15,983	18,444	23,166	34,115	50,436
By education level - All sectors - Masters or professional degree (jobs)		2,833	4,128	4,876	6,193	9,198	13,628
By education level - All sectors - Doctoral degree (jobs)		436	646	794	1,027	1,548	2,287
Related work experience - All sectors - None (jobs)		8,901	12,561	13,799	16,335	23,155	34,351
Related work experience - All sectors - Up to 1 year (jobs)		14,097	19,007	20,792	23,391	32,066	47,365
Related work experience - All sectors - 1 to 4 years (jobs)		19,621	28,601	32,213	39,947	58,105	86,158
Related work experience - All sectors - 4 to 10 years (jobs)		12,253	18,352	20,745	26,156	38,158	56,478
Related work experience - All sectors - Over 10 years (jobs)		3,217	4,728	5,355	6,687	9,704	14,336
On-the-Job Training - All sectors - None (jobs)		3,277	4,597	5,144	6,171	8,780	13,019
On-the-Job Training - All sectors - Up to 1 year (jobs)		40,186	55,921	62,285	73,850	105,129	155,595
On-the-Job Training - All sectors - 1 to 4 years (jobs)		10,682	16,428	18,438	23,454	34,153	50,626
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,430	5,538	6,194	8,018	11,694	17,347
On-the-Job Training - All sectors - Over 10 years (jobs)		514	765	843	1,024	1,432	2,102
On-Site or In-Plant Training - All sectors - None (jobs)		9,262	13,385	15,055	18,402	26,547	39,321
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		36,242	50,596	56,311	66,909	95,193	140,908
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		8,516	12,871	14,402	18,105	26,242	38,902
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,568	5,646	6,304	8,077	11,746	17,395
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		501	750	832	1,023	1,461	2,163
Wage income - All (million \$2019)		3,025	4,440	5,053	6,282	9,192	13,782

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	289	271	246	226	211	194	173
Final energy use - Residential (PJ)	158	150	143	137	130	120	108
Final energy use - Commercial (PJ)	119	116	113	110	106	102	97.9
Final energy use - Industry (PJ)	698	728	742	746	756	762	767

Table 20: E- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		2.47	2.54	3.3	3.45	4.74	5.02

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	6.74	95.6	184	596	1,008	1,919	2,831
Vehicle stocks - LDV – All others (1000 units)	3,700	3,700	3,700	3,510	3,320	2,558	1,797
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	114	242	813	2,567	3,737
Public EV charging plugs - DC Fast (1000 units)	0.103		0.425		2.32		6.52
Public EV charging plugs - L2 (1000 units)	0.26		10.2		55.9		157

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 (%)	4.32	7.79	10.3	18.6	37.9	61.5	75.1
Sales of space heating units - Electric Resistance (%)	10.7	15	14.6	13.6	11.1	7.88	6.19
Sales of space heating units - Gas (%)	74.1	59.4	57.7	52.1	39	22.8	13.2
Sales of space heating units - Fossil (%)	10.9	17.8	17.4	15.8	12.1	7.79	5.49
Sales of water heating units - Electric Heat Pump (%)	0	0.379	1.42	4.88	13.3	23.9	30.1
Sales of water heating units - Electric Resistance (%)	25.3	40.4	40.9	42.9	47.7	53.9	57.5
Sales of water heating units - Gas Furnace (%)	74.7	59.2	57.6	52.2	39	22.2	12.3
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.026	0.025	0.025
Sales of cooking units - Electric Resistance (%)	62.1	63.1	66.6	75.7	88.4	96.3	99
Sales of cooking units - Gas (%)	37.9	36.9	33.4	24.3	11.6	3.74	1.01
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.72	3.37				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.46	6.56	8.85	16.3	34.3	56.8	70
Sales of space heating units - Electric Resistance (%)	4.11	5.51	5.75	6.55	8.23	10.1	11.1
Sales of space heating units - Gas Furnace (%)	90.9	85.6	83.2	75.4	56.5	32.5	18.5
Sales of space heating units - Fossil (%)	2.55	2.28	2.17	1.72	1.01	0.534	0.37
Sales of water heating units - Electric Heat Pump (%)	0.634	1.28	2.56	6.82	17.1	30.1	37.7
Sales of water heating units - Electric Resistance (%)	5.5	7.41	8.68	12.8	22.8	35.4	42.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	93	90.3	87.8	79.5	59.3	33.8	18.7
Sales of water heating units - Other (%)	0.862	0.976	0.957	0.895	0.802	0.745	0.724
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		9,055	9,867				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,784	2,387	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,481	3,449	3,554	2,915	6,761	8,863	10,245
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-65.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-131
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
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)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306

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)							-4,209
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-7,458
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-236
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-11,904

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-4,209
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-14,138
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-472
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-18,820
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,113
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							429
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,638
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,797
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							859
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,751

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)		32.4	0.025	0.023	0.019	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		10.4	5.65	1.82	1.11	0.487	0.303
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.2	36.1	27.1	15.5	6.99	2.75
Premature deaths from air pollution - Gas Stations (deaths)		3.42	3.11	2.34	1.39	0.686	0.339
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.07	6.83	4.8	2.74	1.33	0.519
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.441	0.359	0.246	0.143	0.061	0.021
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.5	2.38	1.91	1.28	0.658	0.247
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.65	3.47	3.28	3.08	2.88	2.67
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.92	5.17	3.91	2.51	1.44	0.724

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.844	0.654	0.476	0.328	0.207
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.556	0.46	0.37	0.285	0.207	0.135
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.627	0.131	0.124	0.115	0.112	0.081
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47	43.7	37.4	26.6	16.2	2.41
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		287	0.217	0.207	0.172	0.115	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		92.4	50.1	16.2	9.87	4.32	2.69
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		349	321	241	137	62.1	24.5
Monetary damages from air pollution - Gas Stations (million \$2019)		30.3	27.6	20.7	12.3	6.08	3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		71.5	60.6	42.5	24.3	11.8	4.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		3.91	3.18	2.18	1.27	0.54	0.182
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		22.1	21.1	17	11.3	5.83	2.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		32.3	30.7	29	27.2	25.5	23.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		52.4	45.8	34.6	22.3	12.7	6.41
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.2	7.47	5.79	4.21	2.9	1.83
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		4.93	4.07	3.28	2.53	1.83	1.19
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		5.54	1.15	1.09	1.02	0.987	0.715
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		418	388	332	236	144	21.4

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		6,919	6,927	6,695	3,628	1,810	3,657
By economic sector - Construction (jobs)		13,532	28,011	38,812	55,662	71,394	95,789
By economic sector - Manufacturing (jobs)		7,592	8,829	10,854	10,981	12,637	17,179
By economic sector - Mining (jobs)		1,813	1,226	825	534	320	24.4
By economic sector - Other (jobs)		1,111	3,579	4,760	7,370	9,351	13,000
By economic sector - Pipeline (jobs)		407	349	258	184	122	34.4
By economic sector - Professional (jobs)		9,449	17,164	26,056	38,265	53,250	77,829

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		7,096	10,918	15,086	21,227	28,583	41,533
By economic sector - Utilities (jobs)		11,228	17,134	27,163	40,915	57,497	80,216
By resource sector - Biomass (jobs)		16,203	15,770	14,900	8,481	7,009	17,222
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		1,588	409	0	0	0	0
By resource sector - Grid (jobs)		17,035	28,466	48,325	74,704	106,557	150,814
By resource sector - Natural Gas (jobs)		3,386	3,098	2,277	2,078	2,233	1,625
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		3,741	3,154	2,475	1,865	1,304	0.009
By resource sector - Solar (jobs)		1,459	15,571	14,635	21,194	20,427	23,293
By resource sector - Wind (jobs)		15,734	27,667	47,897	70,443	97,432	136,309
By education level - All sectors - High school diploma or less (jobs)		27,814	42,331	56,466	73,987	94,608	131,833
By education level - All sectors - Associates degree or some college (jobs)		16,671	28,075	40,013	56,711	75,505	105,324
By education level - All sectors - Bachelors degree (jobs)		11,318	18,207	26,016	36,655	49,355	69,945
By education level - All sectors - Masters or professional degree (jobs)		2,895	4,751	6,885	9,790	13,281	18,967
By education level - All sectors - Doctoral degree (jobs)		447	773	1,130	1,622	2,214	3,194
Related work experience - All sectors - None (jobs)		9,048	14,067	19,199	25,866	33,691	47,199
Related work experience - All sectors - Up to 1 year (jobs)		14,302	21,483	28,404	36,597	46,385	64,955
Related work experience - All sectors - 1 to 4 years (jobs)		20,002	32,453	45,683	63,759	84,776	118,980
Related work experience - All sectors - 4 to 10 years (jobs)		12,509	20,780	29,617	41,878	55,908	78,252
Related work experience - All sectors - Over 10 years (jobs)		3,284	5,353	7,607	10,666	14,204	19,876
On-the-Job Training - All sectors - None (jobs)		3,332	5,297	7,229	9,807	12,782	17,953
On-the-Job Training - All sectors - Up to 1 year (jobs)		40,872	63,110	86,482	116,434	152,255	214,194
On-the-Job Training - All sectors - 1 to 4 years (jobs)		10,911	18,581	26,570	37,843	50,435	70,149
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,507	6,270	9,025	13,039	17,375	24,061
On-the-Job Training - All sectors - Over 10 years (jobs)		523	879	1,204	1,643	2,117	2,907
On-Site or In-Plant Training - All sectors - None (jobs)		9,437	15,284	21,267	29,304	38,663	54,313
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		36,863	57,089	78,306	105,625	138,093	194,025
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		8,691	14,566	20,653	29,143	38,680	53,827
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,644	6,364	9,110	13,061	17,377	24,103
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		510	834	1,175	1,632	2,150	2,995
Wage income - All (million \$2019)		3,083	4,989	7,099	9,963	13,378	19,037

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	288	269	235	195	158	136	127
Final energy use - Residential (PJ)	158	149	141	125	107	92.3	82.5
Final energy use - Commercial (PJ)	119	116	111	104	96.2	90.2	86.6
Final energy use - Industry (PJ)	698	727	740	738	743	749	755

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)		3.02	3.15	5.47	5.86	5.07	5.32

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	8.7	311	613	1,671	2,729	3,574	4,420
Vehicle stocks - LDV – All others (1000 units)	3,685	3,509	3,333	2,429	1,525	863	201
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		710	1,814	2,950	4,464	4,863	4,634
Public EV charging plugs - DC Fast (1000 units)	0.103		1.41		6.29		10.2
Public EV charging plugs - L2 (1000 units)	0.26		34		151		245

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 (%)	4.32	9.3	34.2	83.1	91.9	92.5	92.3
Sales of space heating units - Electric Resistance (%)	10.7	14.9	11.7	5.07	3.86	3.82	4.03
Sales of space heating units - Gas (%)	74.1	58.4	41.4	7.68	1.69	1.31	1.28
Sales of space heating units - Fossil (%)	10.9	17.4	12.6	4.14	2.53	2.35	2.41
Sales of water heating units - Electric Heat Pump (%)	0	0.81	11.1	33.7	37.7	37.9	37.9
Sales of water heating units - Electric Resistance (%)	25.3	40.6	46.5	59.5	61.9	62.1	62
Sales of water heating units - Gas Furnace (%)	74.7	58.5	42.4	6.78	0.4	0	0
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.025	0.025	0.025
Sales of cooking units - Electric Resistance (%)	62.2	70.3	94.9	99.7	100	100	100
Sales of cooking units - Gas (%)	37.8	29.7	5.08	0.256	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.73	3.43				

Table 33: E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.46	7.62	30.1	77.9	86.5	87	87
Sales of space heating units - Electric Resistance (%)	4.11	5.76	8.25	11.9	12.5	12.5	12.5
Sales of space heating units - Gas Furnace (%)	90.9	84.7	61.3	10.2	1.03	0.455	0.455
Sales of space heating units - Fossil (%)	2.55	1.96	0.38	0.016	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.634	1.83	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	5.5	7.95	20.3	47	51.7	52	52
Sales of water heating units - Gas Furnace (%)	93	89.3	64.5	10.3	0.611	0	0
Sales of water heating units - Other (%)	0.862	0.936	0.728	0.68	0.676	0.678	0.678
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		9,055	9,857				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,784	3,083	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,481	3,437	5,070	4,525	6,695	8,859	10,240
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	173	309	395	526	699	901	1,141
Installed renewables - Solar - Base land use assumptions (MW)	91.5	91.5	10,525	18,778	30,538	38,503	50,301
Installed renewables - Wind - Base land use assumptions (MW)	10,744	15,776	23,965	46,683	89,819	154,465	210,247
Installed renewables - Solar - Constrained land use assumptions (MW)	91.6	91.6	6,438	16,476	28,582	40,516	60,723
Installed renewables - Wind - Constrained land use assumptions (MW)	11,957	19,265	29,070	48,969	59,818	61,551	119,158
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	12.5	9.1	12.2	7.82	10.9
Capital invested - Wind - Base (billion \$2018)		7.4	11	28.2	51	72.5	59.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	195	195	19,777	35,039	56,724	71,448	93,207
Wind - Base land use assumptions (GWh)	41,883	59,332	87,562	164,486	307,797	516,732	689,511
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	390	390	24,171	61,417	106,168	150,245	224,399
Wind - Constrained land use assumptions (GWh)	83,766	133,262	198,265	325,109	391,517	401,621	789,938
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO ₂ e/y)							-65.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-278
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-8,305

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-98.5
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-551
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-16,885
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-131
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-7,074
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-25,467
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-824
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
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)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-4,209
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-7,458
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-236
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-11,904
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-4,209
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-14,138
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-472
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-18,820
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,113
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							429
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,638
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,797
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							859
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,751

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)		32.4	0.025	0.023	0.019	0.013	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		11.7	5.61	6.06	4.18	1.7	0.78
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.2	36.1	27.1	15.5	6.99	2.75
Premature deaths from air pollution - Gas Stations (deaths)		3.42	3.11	2.34	1.39	0.686	0.339
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.07	6.83	4.8	2.74	1.33	0.519
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.441	0.359	0.246	0.143	0.061	0.021
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.5	2.38	1.91	1.28	0.658	0.247
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.65	3.47	3.28	3.08	2.88	2.67
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.92	5.17	3.91	2.51	1.44	0.724
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.844	0.654	0.476	0.328	0.207
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.556	0.46	0.37	0.285	0.207	0.135
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.487	0.13	0.124	0.116	0.112	0.081
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		48.4	46.2	44.7	37.3	30.8	22.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		287	0.217	0.207	0.172	0.115	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		104	49.7	53.7	37	15.1	6.91
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		349	321	241	137	62.1	24.5
Monetary damages from air pollution - Gas Stations (million \$2019)		30.3	27.6	20.7	12.3	6.08	3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		71.5	60.6	42.5	24.3	11.8	4.6
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		3.91	3.18	2.18	1.27	0.54	0.182
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		22.1	21.1	17	11.3	5.83	2.18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		32.3	30.7	29	27.2	25.5	23.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		52.4	45.8	34.6	22.3	12.7	6.41
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.2	7.47	5.79	4.21	2.9	1.83

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		4.93	4.07	3.28	2.53	1.83	1.19
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		4.3	1.15	1.09	1.02	0.993	0.715
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		430	410	397	331	273	201

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		6,919	7,005	6,713	3,636	2,217	3,631
By economic sector - Construction (jobs)		12,941	18,472	18,167	19,691	22,418	25,214
By economic sector - Manufacturing (jobs)		7,139	7,137	6,964	5,524	4,805	5,897
By economic sector - Mining (jobs)		1,849	1,279	945	677	477	352
By economic sector - Other (jobs)		1,153	1,471	1,865	2,117	2,493	2,803
By economic sector - Pipeline (jobs)		429	1,364	574	322	332	582
By economic sector - Professional (jobs)		8,699	10,509	11,728	13,427	17,632	21,935
By economic sector - Trade (jobs)		6,812	7,207	7,633	7,823	8,971	10,475
By economic sector - Utilities (jobs)		10,508	16,142	15,068	16,924	19,747	23,053
By resource sector - Biomass (jobs)		16,203	15,967	14,980	8,521	8,858	16,226
By resource sector - CO2 (jobs)		0	7,999	1,820	102	631	3,057
By resource sector - Coal (jobs)		1,588	409	0	0	0	0
By resource sector - Grid (jobs)		15,658	19,287	24,052	29,156	34,472	39,284
By resource sector - Natural Gas (jobs)		3,640	3,966	3,437	3,423	2,904	2,323
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		3,739	3,174	2,517	1,961	1,573	1,344
By resource sector - Solar (jobs)		2,687	3,002	4,283	3,540	3,526	3,635
By resource sector - Wind (jobs)		12,935	16,782	18,568	23,438	27,127	28,074
By education level - All sectors - High school diploma or less (jobs)		26,804	32,703	31,954	30,274	32,533	38,758
By education level - All sectors - Associates degree or some college (jobs)		15,808	20,763	20,430	21,578	24,839	29,127
By education level - All sectors - Bachelors degree (jobs)		10,694	13,235	13,275	14,003	16,544	19,806
By education level - All sectors - Masters or professional degree (jobs)		2,727	3,379	3,462	3,699	4,438	5,347
By education level - All sectors - Doctoral degree (jobs)		418	505	536	587	737	904
Related work experience - All sectors - None (jobs)		8,680	10,810	10,571	10,357	11,456	13,648
Related work experience - All sectors - Up to 1 year (jobs)		13,792	16,418	16,233	15,076	15,962	19,111
Related work experience - All sectors - 1 to 4 years (jobs)		19,021	24,059	23,804	24,629	28,423	33,772
Related work experience - All sectors - 4 to 10 years (jobs)		11,848	15,341	15,129	15,974	18,534	21,857
Related work experience - All sectors - Over 10 years (jobs)		3,108	3,956	3,920	4,106	4,716	5,554
On-the-Job Training - All sectors - None (jobs)		3,192	3,868	3,850	3,821	4,290	5,111
On-the-Job Training - All sectors - Up to 1 year (jobs)		39,097	47,680	47,187	46,452	51,871	62,091
On-the-Job Training - All sectors - 1 to 4 years (jobs)		10,338	13,771	13,495	14,367	16,583	19,377
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,325	4,630	4,505	4,874	5,654	6,559

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		499	637	621	628	694	805
On-Site or In-Plant Training - All sectors - None (jobs)		8,986	11,219	11,122	11,313	12,970	15,475
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		35,265	43,160	42,681	42,106	46,936	56,040
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		8,254	10,830	10,625	11,156	12,780	14,969
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,459	4,736	4,604	4,928	5,692	6,625
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		486	641	625	639	713	834
Wage income - All (million \$2019)		2,934	3,762	3,764	3,905	4,505	5,419

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	288	269	235	195	158	136	127
Final energy use - Residential (PJ)	158	149	141	125	107	92.3	82.5
Final energy use - Commercial (PJ)	119	116	111	104	96.2	90.2	86.6
Final energy use - Industry (PJ)	698	727	740	738	743	749	755

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)		3.02	3.15	5.47	5.86	5.07	5.32

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	8.7	311	613	1,671	2,729	3,574	4,420
Vehicle stocks - LDV – All others (1000 units)	3,685	3,509	3,333	2,429	1,525	863	201
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		710	1,814	2,950	4,464	4,863	4,634
Public EV charging plugs - DC Fast (1000 units)	0.103		1.41		6.29		10.2
Public EV charging plugs - L2 (1000 units)	0.26		34		151		245

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 (%)	4.32	9.3	34.2	83.1	91.9	92.5	92.3
Sales of space heating units - Electric Resistance (%)	10.7	14.9	11.7	5.07	3.86	3.82	4.03
Sales of space heating units - Gas (%)	74.1	58.4	41.4	7.68	1.69	1.31	1.28
Sales of space heating units - Fossil (%)	10.9	17.4	12.6	4.14	2.53	2.35	2.41
Sales of water heating units - Electric Heat Pump (%)	0	0.81	11.1	33.7	37.7	37.9	37.9
Sales of water heating units - Electric Resistance (%)	25.3	40.6	46.5	59.5	61.9	62.1	62
Sales of water heating units - Gas Furnace (%)	74.7	58.5	42.4	6.78	0.4	0	0
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.025	0.025	0.025
Sales of cooking units - Electric Resistance (%)	62.2	70.3	94.9	99.7	100	100	100
Sales of cooking units - Gas (%)	37.8	29.7	5.08	0.256	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.73	3.43				

Table 44: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Commercial*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.46	7.62	30.1	77.9	86.5	87	87
Sales of space heating units - Electric Resistance (%)	4.11	5.76	8.25	11.9	12.5	12.5	12.5
Sales of space heating units - Gas Furnace (%)	90.9	84.7	61.3	10.2	1.03	0.455	0.455
Sales of space heating units - Fossil (%)	2.55	1.96	0.38	0.016	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.634	1.83	14.5	42	47	47.3	47.3
Sales of water heating units - Electric Resistance (%)	5.5	7.95	20.3	47	51.7	52	52
Sales of water heating units - Gas Furnace (%)	93	89.3	64.5	10.3	0.611	0	0
Sales of water heating units - Other (%)	0.862	0.936	0.728	0.68	0.676	0.678	0.678
Sales of cooking units - Electric Resistance (%)	44.8	57.1	84	89.3	89.6	89.6	89.6
Sales of cooking units - Gas (%)	55.2	42.9	16	10.7	10.4	10.4	10.4
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		9,055	9,857				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,784	3,083	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,475	3,372	6,507	7,177	8,253	5,841	6,834
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	173	309	395	526	699	901	1,141
Installed renewables - Solar - Base land use assumptions (MW)	91.5	1,283	2,887	5,116	6,404	7,451	7,451
Installed renewables - Wind - Base land use assumptions (MW)	10,744	11,366	16,554	21,745	31,808	45,769	46,007
Installed renewables - Solar - Constrained land use assumptions (MW)	630	3,072	4,419	6,149	7,294	8,284	8,284
Installed renewables - Wind - Constrained land use assumptions (MW)	10,744	12,837	19,171	26,087	32,929	39,975	47,282
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		1.6	1.92	2.46	1.34	1.03	0
Capital invested - Wind - Base (billion \$2018)		0.916	6.86	6.44	11.9	15.7	0.297
Capital invested - Solar PV - Constrained (billion \$2018)		3.27	1.61	1.91	1.19	0.971	0
Capital invested - Wind - Constrained (billion \$2018)		3.08	8.43	8.58	8.09	7.9	7.74

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	195	2,437	5,463	9,628	12,029	13,967	13,967
Wind - Base land use assumptions (GWh)	41,883	44,041	61,913	79,746	114,129	161,498	162,421
Offshore Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Constrained land use assumptions (GWh)	1,214	5,805	8,316	11,567	13,697	15,525	15,525
Wind - Constrained land use assumptions (GWh)	41,883	49,047	70,382	93,314	115,649	138,138	161,130
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)							-65.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-131
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-732

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,074
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-25,467
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-824
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
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)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-4,209
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-7,458
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-236
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-11,904
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-4,209
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-14,138
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-472
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-18,820

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							4,113
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							429
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							6,638
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,095
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,797
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							859
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							10,751

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)		32.4	0.025	0.023	0.019	0.013	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		11	4.87	2.72	1.65	0.737	0.382
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.8	39.6	38.1	34	26.9	18.3
Premature deaths from air pollution - Gas Stations (deaths)		3.48	3.47	3.32	2.96	2.35	1.63
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.11	7.34	6.54	5.55	4.36	3.09
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.449	0.431	0.413	0.371	0.298	0.223
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.51	2.55	2.56	2.42	2	1.49
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.65	3.47	3.28	3.08	2.88	2.67
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.94	5.64	5.27	4.67	3.85	2.95
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.04	0.919	0.808	0.687	0.569	0.462
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.556	0.493	0.434	0.377	0.324	0.275
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.553	0.131	0.128	0.123	0.119	0.113

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)		47.7	42.8	36.8	31.9	28	19.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		287	0.217	0.207	0.172	0.115	0.003
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		97.1	43.2	24.1	14.6	6.53	3.39
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		354	352	339	303	239	163
Monetary damages from air pollution - Gas Stations (million \$2019)		30.9	30.7	29.4	26.2	20.8	14.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		71.8	65.1	57.9	49.2	38.6	27.4
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		3.98	3.82	3.66	3.28	2.64	1.97
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		22.3	22.6	22.7	21.4	17.8	13.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		32.3	30.7	29	27.2	25.5	23.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		52.6	49.9	46.6	41.3	34.1	26.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.22	8.14	7.15	6.08	5.04	4.09
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		4.93	4.37	3.85	3.34	2.87	2.43
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		4.88	1.16	1.13	1.08	1.05	0.995
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		424	380	327	283	249	172

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		6,919	6,949	6,691	5,787	3,251	5,764
By economic sector - Construction (jobs)		13,290	23,410	24,509	28,644	36,344	56,292
By economic sector - Manufacturing (jobs)		7,472	8,206	8,314	7,909	7,891	12,692
By economic sector - Mining (jobs)		1,796	1,272	971	748	539	368
By economic sector - Other (jobs)		1,107	2,093	2,427	3,193	4,208	7,678
By economic sector - Pipeline (jobs)		415	1,242	499	273	285	504
By economic sector - Professional (jobs)		9,230	14,190	17,464	23,773	30,614	48,450
By economic sector - Trade (jobs)		6,975	9,058	10,423	12,407	15,429	24,393
By economic sector - Utilities (jobs)		10,824	17,691	18,469	22,419	30,834	48,269
By resource sector - Biomass (jobs)		16,206	15,828	14,901	17,562	14,830	28,297
By resource sector - CO2 (jobs)		0	7,266	1,653	92.6	573	2,777
By resource sector - Coal (jobs)		1,406	317	0	0	0	0
By resource sector - Grid (jobs)		16,286	23,268	30,388	39,669	55,323	87,912
By resource sector - Natural Gas (jobs)		3,461	2,745	2,291	2,070	2,505	2,235
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		3,770	3,335	2,944	2,598	2,143	1,670

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		1,655	4,870	3,251	5,039	5,919	17,471
By resource sector - Wind (jobs)		15,243	26,483	34,338	38,124	48,103	64,048
By education level - All sectors - High school diploma or less (jobs)		27,362	38,074	39,684	44,606	52,663	83,521
By education level - All sectors - Associates degree or some college (jobs)		16,309	25,049	26,829	31,924	40,550	63,883
By education level - All sectors - Bachelors degree (jobs)		11,084	16,160	17,787	21,770	27,495	43,301
By education level - All sectors - Masters or professional degree (jobs)		2,835	4,174	4,702	5,859	7,425	11,712
By education level - All sectors - Doctoral degree (jobs)		438	654	765	995	1,262	1,992
Related work experience - All sectors - None (jobs)		8,890	12,682	13,353	15,379	18,646	29,567
Related work experience - All sectors - Up to 1 year (jobs)		14,086	19,168	20,164	22,469	26,074	41,430
Related work experience - All sectors - 1 to 4 years (jobs)		19,594	28,910	31,086	37,191	46,547	73,503
Related work experience - All sectors - 4 to 10 years (jobs)		12,242	18,569	20,002	23,980	30,392	47,756
Related work experience - All sectors - Over 10 years (jobs)		3,215	4,782	5,163	6,136	7,737	12,153
On-the-Job Training - All sectors - None (jobs)		3,276	4,643	4,973	5,820	7,089	11,245
On-the-Job Training - All sectors - Up to 1 year (jobs)		40,138	56,451	60,242	70,116	85,004	134,684
On-the-Job Training - All sectors - 1 to 4 years (jobs)		10,671	16,630	17,770	21,164	26,989	42,354
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,429	5,612	5,969	7,126	9,178	14,352
On-the-Job Training - All sectors - Over 10 years (jobs)		514	774	813	927	1,135	1,773
On-Site or In-Plant Training - All sectors - None (jobs)		9,260	13,526	14,534	17,282	21,342	33,743
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		36,195	51,083	54,462	63,271	76,844	121,686
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		8,506	13,024	13,888	16,444	20,796	32,694
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,566	5,720	6,079	7,229	9,254	14,467
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		500	759	804	928	1,159	1,819
Wage income - All (million \$2019)		3,021	4,488	4,881	5,849	7,371	11,768

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	289	271	246	226	211	194	173
Final energy use - Residential (PJ)	158	150	143	137	130	120	108
Final energy use - Commercial (PJ)	119	116	113	110	106	102	97.9
Final energy use - Industry (PJ)	698	728	742	746	756	762	767

Table 52: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		2.47	2.54	3.3	3.45	4.74	5.02

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	6.74	95.6	184	596	1,008	1,919	2,831
Vehicle stocks - LDV – All others (1000 units)	3,700	3,700	3,700	3,510	3,320	2,558	1,797
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	114	242	813	2,567	3,737
Public EV charging plugs - DC Fast (1000 units)	0.103		0.425		2.32		6.52
Public EV charging plugs - L2 (1000 units)	0.26		10.2		55.9		157

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 (%)	4.32	7.79	10.3	18.6	37.9	61.5	75.1
Sales of space heating units - Electric Resistance (%)	10.7	15	14.6	13.6	11.1	7.88	6.19
Sales of space heating units - Gas (%)	74.1	59.4	57.7	52.1	39	22.8	13.2
Sales of space heating units - Fossil (%)	10.9	17.8	17.4	15.8	12.1	7.79	5.49
Sales of water heating units - Electric Heat Pump (%)	0	0.379	1.42	4.88	13.3	23.9	30.1
Sales of water heating units - Electric Resistance (%)	25.3	40.4	40.9	42.9	47.7	53.9	57.5
Sales of water heating units - Gas Furnace (%)	74.7	59.2	57.6	52.2	39	22.2	12.3
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.026	0.025	0.025
Sales of cooking units - Electric Resistance (%)	62.1	63.1	66.6	75.7	88.4	96.3	99
Sales of cooking units - Gas (%)	37.9	36.9	33.4	24.3	11.6	3.74	1.01
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.72	3.37				

Table 55: E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.46	6.56	8.85	16.3	34.3	56.8	70
Sales of space heating units - Electric Resistance (%)	4.11	5.51	5.75	6.55	8.23	10.1	11.1
Sales of space heating units - Gas Furnace (%)	90.9	85.6	83.2	75.4	56.5	32.5	18.5
Sales of space heating units - Fossil (%)	2.55	2.28	2.17	1.72	1.01	0.534	0.37
Sales of water heating units - Electric Heat Pump (%)	0.634	1.28	2.56	6.82	17.1	30.1	37.7
Sales of water heating units - Electric Resistance (%)	5.5	7.41	8.68	12.8	22.8	35.4	42.8
Sales of water heating units - Gas Furnace (%)	93	90.3	87.8	79.5	59.3	33.8	18.7
Sales of water heating units - Other (%)	0.862	0.976	0.957	0.895	0.802	0.745	0.724
Sales of cooking units - Electric Resistance (%)	44.8	49.3	53.1	63	76.9	85.5	88.5
Sales of cooking units - Gas (%)	55.2	50.7	46.9	37	23.1	14.5	11.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		9,055	9,867				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,784	3,083	0	0	0	0	0
Installed thermal - Natural gas (MW)	3,481	3,443	3,378	2,741	3,801	6,437	10,243
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0.005	0.13	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0.012	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	8.02	0.797	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	9.52	264	264	264	264	264
Biomass w/ccu power plant (GWh)	0	0	0	0	9,003	9,897	9,897
Biomass w/ccu allam power plant (GWh)	0	0	0	0	11.5	11.5	11.5

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	7	8	8
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	25	39	49
Number of facilities - Diesel (quantity)	0	0	0	1	2	2	2
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	1	2	2	2
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	44
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)		5.5	145	27.7	29,846	11,171	70,993
Biomass purchases (million \$2018/y)		311	335	337	3,172	4,260	8,697

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	3.35	41.1	55.5	96.1
Annual - BECCS (MMT)		0	0	0	37.8	52.1	92.6
Annual - NGCC (MMT)		0	0.01	0	0	0	0
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	3.24	6.59	47.7	103	199
Cumulative - BECCS (MMT)		0	0	0	37.8	89.9	182
Cumulative - NGCC (MMT)		0	0.01	0.01	0.01	0.01	0.01
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	13.3	16.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	617	790	1,407	1,407	1,407
Spur (km)		0	47	96.9	1,400	2,882	4,746
All (km)		0	664	887	2,807	4,289	6,153
Cumulative investment - Trunk (million \$2018)		0	4,230	5,220	8,425	8,425	8,425
Cumulative investment - Spur (million \$2018)		0	39.1	191	1,957	3,232	5,299
Cumulative investment - All (million \$2018)		0	4,269	5,411	10,382	11,657	13,724

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	0.01	0.02	0.02	0.02	0.02
Wells and facilities construction costs (million \$2020)		0	0	0.02	0.03	0.06	0.07

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)							-65.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-98.5
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-551
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-16,885
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-131
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-39.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-7,074
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-25,467
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-824
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252

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)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
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)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306

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)							-5,657
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-6,820
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-215
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)							-12,692
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-5,657
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-12,929

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-431
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-19,017
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,826
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,755
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							392
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							436
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							259
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							7,668
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,826
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							17,578
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							784
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							436
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							259
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							21,883

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)		100	56.3	34.1	27.5	24.1	23.4
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		13	11.1	12.3	7.97	6.91	6.38
Premature deaths from air pollution - Mobile - On-Road (deaths)		39.8	40.2	40.7	41.4	42.2	43
Premature deaths from air pollution - Gas Stations (deaths)		3.47	3.5	3.53	3.58	3.62	3.66

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)		8.04	7.31	6.7	6.3	6.08	5.91
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.439	0.376	0.273	0.174	0.095	0.05
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.42	2.43	2.47	2.51	2.47	2.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.82	3.79	3.76	3.71	3.66	3.61
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		6	5.77	5.23	4.62	4.28	4.21
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1.08	1.05	1.02	0.966	0.927	0.903
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.581	0.585	0.591	0.595	0.599	0.606
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.37	0.895	0.689	0.636	0.599	0.547
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		48	49.8	50.3	47.6	46.8	43.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		890	499	302	243	214	207
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		115	98.7	109	70.6	61.2	56.5
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		354	357	362	368	375	382
Monetary damages from air pollution - Gas Stations (million \$2019)		30.7	31	31.2	31.7	32.1	32.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		71.2	64.8	59.4	55.8	53.9	52.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		3.89	3.33	2.42	1.54	0.841	0.447
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		21.5	21.5	21.9	22.3	21.9	21.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		33.8	33.6	33.3	32.9	32.4	31.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		53.1	51.1	46.3	40.9	37.9	37.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		9.57	9.33	9	8.55	8.2	8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.15	5.18	5.23	5.26	5.31	5.36
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		12.1	7.9	6.08	5.61	5.28	4.83

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)		426	442	447	423	416	385

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		6,921	6,919	6,919	6,919	6,919	6,919
By economic sector - Construction (jobs)		9,156	9,825	10,408	12,550	13,652	14,942
By economic sector - Manufacturing (jobs)		6,326	6,391	6,381	6,679	6,653	6,715
By economic sector - Mining (jobs)		1,987	1,567	1,246	1,025	871	708
By economic sector - Other (jobs)		660	793	932	1,222	1,393	1,710
By economic sector - Pipeline (jobs)		428	451	460	437	443	441
By economic sector - Professional (jobs)		6,533	6,814	7,141	8,889	9,946	11,022
By economic sector - Trade (jobs)		5,856	5,564	5,434	6,150	6,589	7,143
By economic sector - Utilities (jobs)		9,674	9,517	9,495	11,021	12,235	13,199
By resource sector - Biomass (jobs)		16,207	15,756	15,351	14,985	14,658	14,361
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		2,195	1,469	719	472	450	173
By resource sector - Grid (jobs)		14,054	13,924	14,107	17,492	19,544	21,757
By resource sector - Natural Gas (jobs)		3,947	4,043	4,269	3,840	4,143	4,026
By resource sector - Nuclear (jobs)		0	0	0	0	0	0
By resource sector - Oil (jobs)		3,794	3,396	3,087	2,902	2,773	2,687
By resource sector - Solar (jobs)			764	1,333	1,499	1,411	2,346
By resource sector - Wind (jobs)		7,343	8,490	9,551	13,701	15,722	17,450
By education level - All sectors - High school diploma or less (jobs)		23,152	23,220	23,398	25,906	27,320	28,895
By education level - All sectors - Associates degree or some college (jobs)		12,950	13,139	13,400	15,541	16,836	18,211
By education level - All sectors - Bachelors degree (jobs)		8,872	8,884	8,966	10,338	11,157	12,016
By education level - All sectors - Masters or professional degree (jobs)		2,240	2,265	2,307	2,695	2,934	3,183
By education level - All sectors - Doctoral degree (jobs)		326	334	344	412	452	494
Related work experience - All sectors - None (jobs)		7,428	7,457	7,527	8,431	8,968	9,552
Related work experience - All sectors - Up to 1 year (jobs)		11,945	12,006	12,118	13,376	14,073	14,861
Related work experience - All sectors - 1 to 4 years (jobs)		15,870	15,950	16,141	18,484	19,878	21,365
Related work experience - All sectors - 4 to 10 years (jobs)		9,730	9,833	9,994	11,566	12,511	13,501
Related work experience - All sectors - Over 10 years (jobs)		2,568	2,595	2,635	3,035	3,271	3,520
On-the-Job Training - All sectors - None (jobs)		2,681	2,686	2,707	3,049	3,242	3,460
On-the-Job Training - All sectors - Up to 1 year (jobs)		33,397	33,465	33,737	37,871	40,270	42,876
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,414	8,559	8,745	10,181	11,052	11,966
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,647	2,721	2,806	3,310	3,624	3,949
On-the-Job Training - All sectors - Over 10 years (jobs)		401	411	420	480	512	548
On-Site or In-Plant Training - All sectors - None (jobs)		7,456	7,523	7,627	8,697	9,316	9,990
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		30,110	30,178	30,432	34,186	36,372	38,744

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,782	6,877	7,008	8,099	8,754	9,449
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,786	2,850	2,926	3,424	3,734	4,052
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		406	414	423	485	524	564
Wage income - All (million \$2019)		2,468	2,519	2,589	2,995	3,268	3,559

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	289	271	248	234	233	240	249
Final energy use - Residential (PJ)	158	150	146	144	143	143	143
Final energy use - Commercial (PJ)	119	119	119	117	116	116	120
Final energy use - Industry (PJ)	698	736	756	769	790	805	826

Table 67: REF scenario - PILLAR 1: Efficiency/Electrification - Electricity demand

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		2.55	2.62	2.79	2.88	2.99	3.08

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 (%)	3.44	11.4	11.7	12.3	12.7	13.2	13.9
Sales of space heating units - Electric Resistance (%)	10.9	14.5	14.3	14.1	13.9	13.4	12.8
Sales of space heating units - Gas (%)	74.6	57.6	57.9	57.8	57.8	58	57.7
Sales of space heating units - Fossil (%)	11.1	16.5	16.1	15.8	15.5	15.4	15.5
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	25.3	40.2	40.1	40	40	40	40
Sales of water heating units - Gas Furnace (%)	74.7	59.8	59.9	59.9	59.9	60	60
Sales of water heating units - Other (%)	0.023	0.026	0.026	0.026	0.026	0.026	0.026
Sales of cooking units - Electric Resistance (%)	61.8	61.8	61.8	61.8	61.8	61.8	61.8
Sales of cooking units - Gas (%)	38.2	38.2	38.2	38.2	38.2	38.2	38.2
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		2.62	2.76				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	2.46	13	44.6	70.4	74.7	75.1	75.2
Sales of space heating units - Electric Resistance (%)	4.11	6.34	10.8	18.4	23.5	24.3	24.4
Sales of space heating units - Gas Furnace (%)	90.9	78.4	43	10.4	1.69	0.519	0.457
Sales of space heating units - Fossil (%)	2.55	2.22	1.72	0.767	0.114	0.009	0
Sales of water heating units - Electric Heat Pump (%)	0.634	0.814	0.811	0.811	0.809	0.805	0.804
Sales of water heating units - Electric Resistance (%)	5.5	6.96	6.98	6.96	6.96	6.97	6.97
Sales of water heating units - Gas Furnace (%)	93	91.2	91.2	91.2	91.3	91.2	91.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	0.862	0.984	0.985	0.982	0.981	0.985	0.986
Sales of cooking units - Electric Resistance (%)	44.8	47.8	47.9	47.8	47.9	47.9	48
Sales of cooking units - Gas (%)	55.2	52.2	52.1	52.2	52.1	52.1	52
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		8,949	9,212				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	5,784	5,406	3,113	1,400	1,400	1,400	0
Installed thermal - Natural gas (MW)	3,497	5,293	5,439	5,204	5,135	4,783	7,447
Installed thermal - Nuclear (MW)	0	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	173	309	395	526	699	901	1,141
Installed renewables - Solar - Base land use assumptions (MW)	91.5	91.5	91.5	245	572	572	572
Installed renewables - Wind - Base land use assumptions (MW)	10,744	10,744	10,744	11,366	16,428	21,098	22,484

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	195	195	195	486	1,101	1,101	1,101
Wind - Base land use assumptions (GWh)	41,883	41,883	41,883	44,041	61,478	77,552	82,405
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

Table 72: REF scenario - PILLAR 6: Land sinks - Forests - REF only

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	3.55		-2.54				-2.27
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.199		-0.358				-0.373
Business-as-usual carbon sink - Total (Mt CO2e/y)	3.35		-2.9				-2.65

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)							-65.8
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-256
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-420
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-20.3
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-244
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,245
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-5,241
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-536
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-278
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,305

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-98.5
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-895
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-756
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-29.7
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-488
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-2,400
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-7,862
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-3,805
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-551
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-16,885
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-131
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-1,534
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-1,092
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-39.8
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-732
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-3,556
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-10,483
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-7,074
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-25,467
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-824
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							10.7
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							195
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							213
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							7.34
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)							178
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							347

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							165
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,151
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							16.1
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							201
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							385
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							11
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)							258
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							520
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							333
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							1,976
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							21.5
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							208
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							557
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							14.7
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)							338
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							693
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							201
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							273

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,306