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

Table 1: *E+ scenario - IMPACTS - Health (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		46.1	38.2	29.3	20.8	14.4	9.57
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		28.2	24.4	20.4	16.3	12.2	8.22
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		15.7	8.65	8.67	8.62	8.79	8.78
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		552	516	462	363	265	162

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

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

Table 2: *E+ scenario - IMPACTS - Jobs (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,842	11,217	13,988	14,724	14,205	14,796
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,462	3,627	4,640	4,916	4,708	4,902
On-the-Job Training - All sectors - Over 10 years (jobs)		347	529	636	644	622	646
On-Site or In-Plant Training - All sectors - None (jobs)		5,977	8,636	10,488	10,922	10,569	11,298
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		22,239	31,536	38,357	40,155	38,888	41,446
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,071	8,707	10,824	11,381	10,989	11,471
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,542	3,671	4,652	4,913	4,700	4,901
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		314	453	577	613	592	621
Wage income - All (million $2019)		2,004	2,778	3,429	3,655	3,570	3,833

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

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

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

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

Table 5: *E+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		6.1	6.25	10.2	10.8	10.4	10.8

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

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

Table 7: *E+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.3	47.7	81.1	88.9	89.3	89.3	89.2
Sales of space heating units - Electric Resistance (%)	22.7	22.3	9.54	6.48	6.3	6.42	6.45
Sales of space heating units - Gas (%)	33.5	16.9	4.84	2.03	1.91	1.91	1.9
Sales of space heating units - Fossil (%)	11.5	13.1	4.52	2.55	2.46	2.42	2.41
Sales of water heating units - Electric Heat Pump (%)	0	10	53.3	63.1	63.6	63.6	63.6
Sales of water heating units - Electric Resistance (%)	61.4	68.3	40.5	34.3	34	34	34
Sales of water heating units - Gas Furnace (%)	34.3	18.9	3.74	0.187	0.002	0	0
Sales of water heating units - Other (%)	4.29	2.81	2.47	2.4	2.41	2.42	2.43
Sales of cooking units - Electric Resistance (%)	75.4	80.6	96.7	99.8	100	100	100
Sales of cooking units - Gas (%)	24.6	19.4	3.31	0.167	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.62	7.56				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	8.09	27.7	70	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	7.4	8.38	10.5	12.6	13	13	13
Sales of space heating units - Gas Furnace (%)	78.4	59.9	18.7	3.71	1.95	1.9	1.9
Sales of space heating units - Fossil (%)	6.11	4.04	0.768	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.257	10.4	53.9	64	64.5	64.5	64.5
Sales of water heating units - Electric Resistance (%)	6.38	10.9	28.3	32.5	32.8	32.8	32.8
Sales of water heating units - Gas Furnace (%)	88.8	74.6	14.8	0.738	0.009	0	0
Sales of water heating units - Other (%)	4.56	4.13	3.01	2.74	2.74	2.73	2.73
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		34,334	38,227				

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	3,912	5,778	5,778
Capital invested - Solar PV - Base (billion $2018)		0.319	11.5	13.4	8.86	6.87	4.82
Capital invested - Wind - Base (billion $2018)		0	0.15	0	0.121	0	0
Capital invested - Offshore Wind - Base (billion $2018)		0	0	0	7.29	3.33	0
Capital invested - Solar PV - Constrained (billion $2018)		2.3	9.86	12.9	9.89	4.44	3.52
Capital invested - Wind - Constrained (billion $2018)		0	0.252	0	0	0	0.037
Capital invested - Offshore Wind - Constrained (billion $2018)		0	0	0	6.79	2.75	0
Capital invested - Biomass power plant (billion $2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0	0.041
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4,358	4,814	23,450	47,034	63,567	77,168	87,246
Wind - Base land use assumptions (GWh)	734	734	1,115	1,115	1,397	1,397	1,397
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	17,825	26,721	26,721
Solar - Constrained land use assumptions (GWh)	1,582	2,734	18,158	43,284	56,333	66,651	83,952
Wind - Constrained land use assumptions (GWh)	734	734	1,305	1,305	1,305	1,305	1,305
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	17,825	26,721	26,721
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	41.1

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

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

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

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

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

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

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

Table 17: *E- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		53.5	35.8	13.7	5.46	1.94	1.03
Premature deaths from air pollution - Mobile - On-Road (deaths)		324	333	329	300	242	167
Premature deaths from air pollution - Gas Stations (deaths)		25.9	26.5	26	23.5	18.8	13.1

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

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

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

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

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		5.28	5.33	6.71	6.92	9.8	10.3

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

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

Table 22: *E- scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.3	41.3	45.1	56.1	73	84	87.9
Sales of space heating units - Electric Resistance (%)	22.7	24.7	23.3	18.9	12.4	8.34	6.89
Sales of space heating units - Gas (%)	33.5	19.2	17.8	13.9	7.91	3.85	2.41
Sales of space heating units - Fossil (%)	11.5	14.8	13.8	11	6.65	3.78	2.79
Sales of water heating units - Electric Heat Pump (%)	0	1.73	6.65	20.8	42.6	56.9	61.8
Sales of water heating units - Electric Resistance (%)	61.4	73.6	70.5	61.3	47.3	38.2	35.1
Sales of water heating units - Gas Furnace (%)	34.3	21.8	20	15.2	7.52	2.43	0.641
Sales of water heating units - Other (%)	4.29	2.87	2.83	2.74	2.59	2.48	2.44
Sales of cooking units - Electric Resistance (%)	75.3	75.9	78.2	84.2	92.5	97.6	99.3
Sales of cooking units - Gas (%)	24.7	24.1	21.8	15.8	7.55	2.44	0.656
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.58	7.45				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	8.09	19.7	24.6	38.6	60.7	76.6	82.8
Sales of space heating units - Electric Resistance (%)	7.4	8.06	8.29	9.07	10.5	11.9	12.7
Sales of space heating units - Gas Furnace (%)	78.4	67.5	62.8	49.1	27.1	11	4.45
Sales of space heating units - Fossil (%)	6.11	4.68	4.33	3.28	1.62	0.513	0.134
Sales of water heating units - Electric Heat Pump (%)	0.257	2.02	6.97	21.3	43.2	57.6	62.7
Sales of water heating units - Electric Resistance (%)	6.38	7.55	9.45	15.2	24.1	29.9	32
Sales of water heating units - Gas Furnace (%)	88.8	86.1	79.3	59.7	29.4	9.53	2.51
Sales of water heating units - Other (%)	4.56	4.35	4.31	3.87	3.3	2.91	2.77
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		34,313	38,231				

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

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

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

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

Table 25: *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)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

Table 26: *E- scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-207

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

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

Table 27: *E+RE+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		47.3	39.2	22.3	13.6	3.61	1.04
Premature deaths from air pollution - Mobile - On-Road (deaths)		318	302	233	136	62	23.6
Premature deaths from air pollution - Gas Stations (deaths)		25.4	23.6	18	10.6	5.05	2.21
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.5	24.3	16.5	9.24	4.59	2.16
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.35	6.76	4.61	2.71	1.29	0.538

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

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

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

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

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

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

Table 30: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		6.1	6.25	10.2	10.8	10.4	10.8

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

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

Table 32: *E+RE+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.3	47.7	81.1	88.9	89.3	89.3	89.2
Sales of space heating units - Electric Resistance (%)	22.7	22.3	9.54	6.48	6.3	6.42	6.45
Sales of space heating units - Gas (%)	33.5	16.9	4.84	2.03	1.91	1.91	1.9
Sales of space heating units - Fossil (%)	11.5	13.1	4.52	2.55	2.46	2.42	2.41
Sales of water heating units - Electric Heat Pump (%)	0	10	53.3	63.1	63.6	63.6	63.6
Sales of water heating units - Electric Resistance (%)	61.4	68.3	40.5	34.3	34	34	34
Sales of water heating units - Gas Furnace (%)	34.3	18.9	3.74	0.187	0.002	0	0
Sales of water heating units - Other (%)	4.29	2.81	2.47	2.4	2.41	2.42	2.43
Sales of cooking units - Electric Resistance (%)	75.4	80.6	96.7	99.8	100	100	100
Sales of cooking units - Gas (%)	24.6	19.4	3.31	0.167	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.62	7.56				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	8.09	27.7	70	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	7.4	8.38	10.5	12.6	13	13	13
Sales of space heating units - Gas Furnace (%)	78.4	59.9	18.7	3.71	1.95	1.9	1.9
Sales of space heating units - Fossil (%)	6.11	4.04	0.768	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.257	10.4	53.9	64	64.5	64.5	64.5
Sales of water heating units - Electric Resistance (%)	6.38	10.9	28.3	32.5	32.8	32.8	32.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	88.8	74.6	14.8	0.738	0.009	0	0
Sales of water heating units - Other (%)	4.56	4.13	3.01	2.74	2.74	2.73	2.73
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		34,334	38,227				

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-510
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,159
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,300

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,926
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-397
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-325
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,331
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,417
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,785
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

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

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

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

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

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

Table 38: *E+RE- scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		65.3	51.6	52	39.6	12.1	4.07
Premature deaths from air pollution - Mobile - On-Road (deaths)		318	302	233	136	62	23.6
Premature deaths from air pollution - Gas Stations (deaths)		25.4	23.6	18	10.6	5.05	2.21
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.5	24.3	16.5	9.24	4.59	2.16
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.35	6.76	4.61	2.71	1.29	0.538
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.62	5.88	4.49	2.99	1.69	0.926
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.58	3.45	3.31	3.15	2.99	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		25.9	23	17	10.7	6.61	4.33
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.2	4.31	3.31	2.35	1.63	1.08
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.18	2.75	2.31	1.84	1.38	0.928
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.65	0.979	0.982	0.976	0.997	0.937
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		63.1	61.2	60.4	52.6	44.5	33.7
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		695	0.948	0.917	0.766	0.544	0.048
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		579	457	461	351	107	36.1
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,831	2,683	2,069	1,209	552	210
Monetary damages from air pollution - Gas Stations (million $2019)		225	209	159	94.2	44.8	19.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		262	215	146	81.9	40.6	19.1
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		74	59.9	40.9	24	11.4	4.76
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		58.6	52.1	39.8	26.5	15	8.2

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

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

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

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

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

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

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

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

Table 41: *E+RE- scenario - PILLAR 1: Efficiency/Electrification - Electricity demand*

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		6.1	6.25	10.2	10.8	10.4	10.8

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.3	47.7	81.1	88.9	89.3	89.3	89.2
Sales of space heating units - Electric Resistance (%)	22.7	22.3	9.54	6.48	6.3	6.42	6.45
Sales of space heating units - Gas (%)	33.5	16.9	4.84	2.03	1.91	1.91	1.9
Sales of space heating units - Fossil (%)	11.5	13.1	4.52	2.55	2.46	2.42	2.41

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	8.09	27.7	70	83.7	85	85.1	85.1
Sales of space heating units - Electric Resistance (%)	7.4	8.38	10.5	12.6	13	13	13
Sales of space heating units - Gas Furnace (%)	78.4	59.9	18.7	3.71	1.95	1.9	1.9
Sales of space heating units - Fossil (%)	6.11	4.04	0.768	0.033	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.257	10.4	53.9	64	64.5	64.5	64.5
Sales of water heating units - Electric Resistance (%)	6.38	10.9	28.3	32.5	32.8	32.8	32.8
Sales of water heating units - Gas Furnace (%)	88.8	74.6	14.8	0.738	0.009	0	0
Sales of water heating units - Other (%)	4.56	4.13	3.01	2.74	2.74	2.73	2.73
Sales of cooking units - Electric Resistance (%)	32	46	79.9	86.5	86.9	86.9	86.9
Sales of cooking units - Gas (%)	68	54	20.1	13.5	13.1	13.1	13.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		34,334	38,227				

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Constrained (billion $2018)		0.049	0.06	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,833	4,343	5,952	19,453	33,552	44,837	47,907
Wind - Base land use assumptions (GWh)	734	862	862	862	1,013	1,013	1,013
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	3,350	5,000	5,486	17,082	29,911	42,873	42,873
Wind - Constrained land use assumptions (GWh)	734	854	999	999	999	999	999
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-207
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,569
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-51
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,827

Table 48: *E+RE- 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)							-207
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,978
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-102
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,287
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							908
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							92.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,118
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							117
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,723
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							186
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,025

Table 49: *E-B+ scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		78.4	0.107	0.103	0.086	0.061	0.005
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		50.5	34.7	16.2	10.5	5.69	2.42
Premature deaths from air pollution - Mobile - On-Road (deaths)		324	333	329	300	242	167
Premature deaths from air pollution - Gas Stations (deaths)		25.9	26.5	26	23.5	18.8	13.1
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.8	27.3	24.3	20.1	15.1	10.2
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.49	8.06	7.64	6.66	5.01	3.24
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.71	6.74	6.69	6.12	4.91	3.55
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.58	3.45	3.31	3.15	2.99	2.81
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		26.1	26.2	25.4	22.7	18.3	13.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.22	4.73	4.24	3.64	3.05	2.5
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.18	2.95	2.7	2.44	2.16	1.89
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.77	0.982	0.99	0.99	1.01	1
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62	55.4	46.6	39.6	34.4	24.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		695	0.948	0.917	0.766	0.544	0.048
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		448	307	144	92.8	50.4	21.5
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,881	2,959	2,922	2,667	2,149	1,488
Monetary damages from air pollution - Gas Stations (million $2019)		230	235	230	208	167	116
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		264	242	215	178	134	90
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		75.2	71.4	67.7	59	44.4	28.7
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		59.4	59.8	59.3	54.3	43.5	31.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		31.7	30.5	29.3	27.9	26.5	24.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		231	232	225	201	162	120
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		46.2	41.9	37.5	32.2	27	22.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		28.2	26.1	23.9	21.6	19.2	16.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		15.6	8.67	8.74	8.74	8.91	8.84
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		551	492	413	352	306	220

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		220	481	200	149	124	110
By economic sector - Construction (jobs)		7,879	15,866	16,703	15,271	16,063	17,336
By economic sector - Manufacturing (jobs)		4,649	7,380	5,767	4,874	6,247	6,661
By economic sector - Mining (jobs)		2,843	2,107	1,560	1,163	756	401
By economic sector - Other (jobs)		690	2,505	2,575	2,521	2,853	3,520
By economic sector - Pipeline (jobs)		622	523	732	384	324	433
By economic sector - Professional (jobs)		4,244	6,986	6,889	6,833	7,230	7,814

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		3,166	4,904	4,878	4,772	5,007	5,494
By economic sector - Utilities (jobs)		10,569	12,002	14,465	14,474	15,426	15,486
By resource sector - Biomass (jobs)		874	1,295	677	625	573	517
By resource sector - CO2 (jobs)		0	0	2,395	27.2	232	1,940
By resource sector - Coal (jobs)		1,272	0	0	0	0	0
By resource sector - Grid (jobs)		11,151	15,645	19,686	22,870	25,871	24,781
By resource sector - Natural Gas (jobs)		6,083	5,345	4,068	3,323	2,730	2,980
By resource sector - Nuclear (jobs)		2,723	2,679	2,637	2,596	2,166	1,582
By resource sector - Oil (jobs)		6,992	5,875	4,946	4,172	3,046	1,753
By resource sector - Solar (jobs)		5,410	20,945	18,361	15,477	16,778	20,971
By resource sector - Wind (jobs)		377	969	1,000	1,352	2,634	2,730
By education level - All sectors - High school diploma or less (jobs)		14,416	22,575	22,950	21,431	23,006	24,361
By education level - All sectors - Associates degree or some college (jobs)		10,825	16,586	17,173	16,100	17,374	18,590
By education level - All sectors - Bachelors degree (jobs)		7,553	10,625	10,658	10,052	10,641	11,142
By education level - All sectors - Masters or professional degree (jobs)		1,833	2,588	2,616	2,502	2,640	2,770
By education level - All sectors - Doctoral degree (jobs)		254	380	373	357	370	391
Related work experience - All sectors - None (jobs)		5,015	7,639	7,849	7,363	7,901	8,410
Related work experience - All sectors - Up to 1 year (jobs)		6,756	10,777	10,824	10,128	10,889	11,568
Related work experience - All sectors - 1 to 4 years (jobs)		12,698	18,910	19,294	18,138	19,390	20,503
Related work experience - All sectors - 4 to 10 years (jobs)		8,212	12,202	12,532	11,745	12,558	13,309
Related work experience - All sectors - Over 10 years (jobs)		2,201	3,226	3,271	3,067	3,291	3,465
On-the-Job Training - All sectors - None (jobs)		1,908	2,927	2,940	2,756	2,929	3,109
On-the-Job Training - All sectors - Up to 1 year (jobs)		23,052	34,610	34,925	32,816	35,175	37,156
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,316	11,109	11,549	10,809	11,597	12,345
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,276	3,578	3,829	3,583	3,818	4,097
On-the-Job Training - All sectors - Over 10 years (jobs)		330	530	525	477	512	547
On-Site or In-Plant Training - All sectors - None (jobs)		5,632	8,624	8,685	8,113	8,683	9,243
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		20,929	31,424	31,816	29,907	32,052	33,853
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,672	8,631	8,939	8,371	8,984	9,552
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,358	3,627	3,856	3,605	3,830	4,091
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		291	447	474	445	481	516
Wage income - All (million $2019)		1,881	2,760	2,861	2,732	2,946	3,137

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		5.28	5.33	6.71	6.92	9.8	10.3

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

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

Table 54: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.3	41.3	45.1	56.1	73	84	87.9
Sales of space heating units - Electric Resistance (%)	22.7	24.7	23.3	18.9	12.4	8.34	6.89
Sales of space heating units - Gas (%)	33.5	19.2	17.8	13.9	7.91	3.85	2.41
Sales of space heating units - Fossil (%)	11.5	14.8	13.8	11	6.65	3.78	2.79
Sales of water heating units - Electric Heat Pump (%)	0	1.73	6.65	20.8	42.6	56.9	61.8
Sales of water heating units - Electric Resistance (%)	61.4	73.6	70.5	61.3	47.3	38.2	35.1
Sales of water heating units - Gas Furnace (%)	34.3	21.8	20	15.2	7.52	2.43	0.641
Sales of water heating units - Other (%)	4.29	2.87	2.83	2.74	2.59	2.48	2.44
Sales of cooking units - Electric Resistance (%)	75.3	75.9	78.2	84.2	92.5	97.6	99.3
Sales of cooking units - Gas (%)	24.7	24.1	21.8	15.8	7.55	2.44	0.656
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.58	7.45				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	8.09	19.7	24.6	38.6	60.7	76.6	82.8
Sales of space heating units - Electric Resistance (%)	7.4	8.06	8.29	9.07	10.5	11.9	12.7
Sales of space heating units - Gas Furnace (%)	78.4	67.5	62.8	49.1	27.1	11	4.45
Sales of space heating units - Fossil (%)	6.11	4.68	4.33	3.28	1.62	0.513	0.134
Sales of water heating units - Electric Heat Pump (%)	0.257	2.02	6.97	21.3	43.2	57.6	62.7
Sales of water heating units - Electric Resistance (%)	6.38	7.55	9.45	15.2	24.1	29.9	32
Sales of water heating units - Gas Furnace (%)	88.8	86.1	79.3	59.7	29.4	9.53	2.51
Sales of water heating units - Other (%)	4.56	4.35	4.31	3.87	3.3	2.91	2.77
Sales of cooking units - Electric Resistance (%)	32	36.2	40.9	53.4	71	81.7	85.5
Sales of cooking units - Gas (%)	68	63.8	59.1	46.6	29	18.3	14.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		34,313	38,231				

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

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

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	227	227	227	227
Spur (km)		0	0	0	0	0	130
All (km)		0	0	227	227	227	358

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

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

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

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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513

Table 63: *E-B+ scenario - PILLAR 6: Land sinks - Agriculture*

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-639
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,348
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-43.3
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,030
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-639
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,559
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-86.7
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,285
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							379
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							775
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							78.8
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							104
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							134
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,472
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							379
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,635
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							158
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							104
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							134
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							4,410

Table 64: *REF scenario - IMPACTS - Health*

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		257	168	146	136	132	126
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		44.9	50.3	58.5	57.6	63.5	61.2
Premature deaths from air pollution - Mobile - On-Road (deaths)		323	337	350	364	378	393
Premature deaths from air pollution - Gas Stations (deaths)		25.8	26.8	27.6	28.6	29.6	30.4
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		29.3	27.2	25.5	24.7	24.8	24.9
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		8.16	6.81	4.91	3.28	2.13	1.5
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		6.33	6.18	6.14	6.25	6.43	6.59
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.74	3.77	3.8	3.81	3.81	3.79
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		26.3	26.2	24.7	23	22.4	23.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		5.37	5.22	4.98	4.66	4.49	4.43
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.33	3.5	3.68	3.84	4	4.17
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		3.27	2.43	2.08	2.01	1.98	1.9
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62.4	67.4	70.3	68	68.7	66
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		2,277	1,485	1,292	1,205	1,169	1,113
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		397	445	518	510	562	542
Monetary damages from air pollution - Mobile - On-Road (million $2019)		2,876	2,995	3,110	3,238	3,364	3,495
Monetary damages from air pollution - Gas Stations (million $2019)		229	237	244	253	262	269
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		260	241	226	219	220	221
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		72.3	60.4	43.5	29.1	18.9	13.3
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		56.1	54.8	54.4	55.3	56.9	58.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		33.1	33.4	33.6	33.7	33.7	33.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		233	232	219	203	198	207

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		47.5	46.2	44.1	41.3	39.8	39.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		29.4	31	32.6	34	35.4	36.9
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		28.9	21.4	18.3	17.7	17.5	16.8
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		554	599	625	604	610	586

Table 65: *REF scenario - IMPACTS - Jobs*

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

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,277	6,547	7,389	7,257	7,829	7,747
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,974	2,098	2,409	2,379	2,588	2,533
On-the-Job Training - All sectors - Over 10 years (jobs)		264	280	311	307	328	336
On-Site or In-Plant Training - All sectors - None (jobs)		4,756	4,914	5,452	5,344	5,715	5,746
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		17,908	18,445	20,464	19,982	21,424	21,406
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,856	5,066	5,708	5,601	6,042	5,991
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,056	2,163	2,464	2,427	2,630	2,574
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		249	263	302	298	324	320
Wage income - All (million $2019)		1,646	1,699	1,906	1,885	2,044	2,044

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		6.29	6.46	8.19	8.55	7.99	8.24

Table 68: *REF scenario - PILLAR 1: Efficiency/Electrification - Residential*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	30.3	53.9	54.7	55.8	56.8	58.1	60.1
Sales of space heating units - Electric Resistance (%)	23.3	20.2	19.9	19.3	18.5	17.3	15.2
Sales of space heating units - Gas (%)	34.5	15.8	18.1	18.8	18.7	18.7	18.7
Sales of space heating units - Fossil (%)	11.8	10.1	7.34	6.13	5.97	5.93	5.99
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	61.4	74.7	74.8	74.6	74.5	74.5	74.4
Sales of water heating units - Gas Furnace (%)	34.3	22.4	22.4	22.5	22.6	22.6	22.7
Sales of water heating units - Other (%)	4.29	2.88	2.88	2.9	2.93	2.93	2.94
Sales of cooking units - Electric Resistance (%)	75.1	75.1	75.1	75.1	75.1	75.1	75.1
Sales of cooking units - Gas (%)	24.9	24.9	24.9	24.9	24.9	24.9	24.9
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		7.46	6.79				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	8.09	26.8	56.4	70.2	72	72.2	72.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Resistance (%)	7.4	9.19	13.8	20.2	25.1	25.8	25.8
Sales of space heating units - Gas Furnace (%)	78.4	59.6	26.8	8.28	2.71	1.96	1.9
Sales of space heating units - Fossil (%)	6.11	4.41	2.99	1.35	0.201	0.017	0
Sales of water heating units - Electric Heat Pump (%)	0.257	0.277	0.272	0.274	0.275	0.273	0.274
Sales of water heating units - Electric Resistance (%)	6.38	6.85	6.76	6.78	6.8	6.76	6.77
Sales of water heating units - Gas Furnace (%)	88.8	88.5	88.5	88.5	88.5	88.5	88.5
Sales of water heating units - Other (%)	4.56	4.4	4.5	4.42	4.47	4.48	4.45
Sales of cooking units - Electric Resistance (%)	32	34.3	34.3	34.3	34.4	34.3	34.3
Sales of cooking units - Gas (%)	68	65.7	65.7	65.7	65.6	65.7	65.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		33,829	35,143				

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,350	3,350	3,350	3,350	3,350	3,350	3,350
Wind - Base land use assumptions (GWh)	734	734	862	862	1,013	1,013	1,115
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Natural uptake (Mt CO2e/y)	-30.9		-14.5				-11.7
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-4.84		-8.07				-8.49
Business-as-usual carbon sink - Total (Mt CO2e/y)	-35.8		-22.6				-20.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-186
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-510
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,159

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-1,300
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-5,926
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-397
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-284
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-325
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,331
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,417
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-278
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,785
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-7,493
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-1,906
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-11,852
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-765
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-426
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,308
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,639
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-29,452
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-370
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-3,061
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-10,827
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-2,556
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-17,779
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,133
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-567
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,291
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-44,532
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,947
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							30.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							389

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 - Extend rotation length (1000 hectares)							2,115
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							471
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							56.7
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							18.8
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							21.1
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							792
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,894
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							45.5
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							402
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,818
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							708
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							82.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							28.1
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							153
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,594
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,831
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							60.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							414
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,521
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							942

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							108
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							37.5
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							122
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,308
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,513