



Net-Zero America - Alabama 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)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		20.1	17.2	9.99	8.07	3.67	1.34
Premature deaths from air pollution - Mobile - On-Road (deaths)		111	103	77.4	44.4	20	7.7
Premature deaths from air pollution - Gas Stations (deaths)		9.74	8.88	6.63	3.89	1.86	0.853
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.94	7.2	4.81	2.71	1.39	0.722
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.571	0.457	0.311	0.181	0.083	0.031
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2	1.75	1.31	0.841	0.438	0.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.67	1.59	1.5	1.41	1.31	1.22
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.28	4.61	3.4	2.16	1.32	0.844
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.963	0.796	0.62	0.45	0.307	0.195
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.566	0.473	0.384	0.298	0.217	0.142
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		18.9	14.9	15	14.9	15.2	15.1
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.3	43.6	38.6	29.8	21.5	13
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		354	0.481	0.436	0.278	0.172	0.012
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		178	153	88.5	71.5	32.5	11.9
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		985	912	688	394	178	68.5
Monetary damages from air pollution - Gas Stations (million \$2019)		86.3	78.6	58.7	34.4	16.5	7.56
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		79.3	63.8	42.6	24	12.3	6.39
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		5.06	4.05	2.75	1.61	0.733	0.273
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		17.7	15.5	11.6	7.46	3.88	1.77
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14.8	14.1	13.3	12.5	11.6	10.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46.7	40.8	30.1	19.1	11.7	7.47

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)		8.53	7.05	5.49	3.98	2.72	1.73
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.01	4.19	3.4	2.64	1.92	1.26
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		167	132	132	132	135	134
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		420	387	342	265	191	116

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		207	421	673	1,127	1,468	1,173
By economic sector - Construction (jobs)		5,947	12,693	15,020	16,872	23,378	28,837
By economic sector - Manufacturing (jobs)		4,148	4,638	5,400	5,537	5,671	6,222
By economic sector - Mining (jobs)		5,168	3,824	2,875	1,979	1,428	977
By economic sector - Other (jobs)		296	1,585	1,959	2,564	4,438	6,275
By economic sector - Pipeline (jobs)		667	817	856	628	561	568
By economic sector - Professional (jobs)		3,849	5,776	6,721	8,234	11,707	14,025
By economic sector - Trade (jobs)		2,902	3,982	4,315	4,990	7,245	9,269
By economic sector - Utilities (jobs)		10,656	13,210	16,241	18,164	21,020	23,580
By resource sector - Biomass (jobs)		890	1,161	1,917	3,392	5,354	5,010
By resource sector - CO2 (jobs)		5.69	2,217	3,546	2,622	3,152	3,827
By resource sector - Coal (jobs)		3,136	1,714	1,496	1,309	1,185	1,051
By resource sector - Grid (jobs)		10,557	14,929	20,970	24,800	32,971	40,572
By resource sector - Natural Gas (jobs)		9,132	8,036	6,638	7,116	5,084	3,801
By resource sector - Nuclear (jobs)		2,660	2,618	2,576	2,536	1,817	658
By resource sector - Oil (jobs)		6,244	5,177	4,041	2,741	1,846	1,054
By resource sector - Solar (jobs)		562	10,160	11,652	14,428	24,663	33,810
By resource sector - Wind (jobs)		655	934	1,223	1,149	844	1,143
By education level - All sectors - High school diploma or less (jobs)		14,044	19,966	23,137	25,763	33,077	39,054
By education level - All sectors - Associates degree or some college (jobs)		10,414	14,793	17,191	19,121	24,530	29,307
By education level - All sectors - Bachelors degree (jobs)		7,349	9,518	10,718	11,825	14,940	17,450
By education level - All sectors - Masters or professional degree (jobs)		1,793	2,341	2,647	2,964	3,806	4,458
By education level - All sectors - Doctoral degree (jobs)		242	329	366	420	562	659
Related work experience - All sectors - None (jobs)		4,801	6,793	7,888	8,821	11,352	13,468
Related work experience - All sectors - Up to 1 year (jobs)		6,498	9,317	10,784	12,104	15,731	18,630
Related work experience - All sectors - 1 to 4 years (jobs)		12,469	17,014	19,518	21,639	27,579	32,540
Related work experience - All sectors - 4 to 10 years (jobs)		7,927	10,946	12,580	13,918	17,717	20,956
Related work experience - All sectors - Over 10 years (jobs)		2,146	2,878	3,289	3,611	4,537	5,333
On-the-Job Training - All sectors - None (jobs)		1,793	2,521	2,869	3,201	4,172	4,965
On-the-Job Training - All sectors - Up to 1 year (jobs)		22,515	30,685	35,247	39,228	50,116	58,995

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)		7,084	10,032	11,617	12,850	16,382	19,475
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,148	3,265	3,823	4,265	5,543	6,659
On-the-Job Training - All sectors - Over 10 years (jobs)		302	444	504	550	702	832
On-Site or In-Plant Training - All sectors - None (jobs)		5,326	7,498	8,616	9,627	12,398	14,661
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		20,502	27,961	32,120	35,702	45,605	53,745
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,499	7,766	8,988	9,946	12,693	15,085
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,241	3,320	3,861	4,287	5,534	6,614
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		273	402	475	532	686	822
Wage income - All (million \$2019)		1,813	2,469	2,866	3,213	4,117	4,895

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		87.1	73.9	54.9	37.3	23.4	12.6
Oil consumption - Cumulative (million bbls)							1,701
Oil production - Annual (million bbls)		10.5	10.6	10.6	8.36	6.8	4.52
Natural gas consumption - Annual (tcf)		580	489	392	295	186	129
Natural gas consumption - Cumulative (tcf)							11,820
Natural gas production - Annual (tcf)		165	156	136	115	91.3	70.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	546	508	443	365	294	250	232
Final energy use - Residential (PJ)	163	153	141	126	114	108	105
Final energy use - Commercial (PJ)	116	116	112	106	101	99.4	100
Final energy use - Industry (PJ)	551	582	615	609	632	649	656

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		3.72	3.8	5.83	6.14	5	5.13

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	12.8	447	881	2,399	3,918	5,132	6,345
Vehicle stocks - LDV – All others (1000 units)	5,291	5,038	4,785	3,487	2,189	1,238	288
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,020	2,605	4,234	6,409	6,981	6,653
Public EV charging plugs - DC Fast (1000 units)	0.07		2.03		9.05		14.7
Public EV charging plugs - L2 (1000 units)	0.285		48.9		217		352

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 (%)	34.1	48.8	80.6	87.8	88.1	88	88
Sales of space heating units - Electric Resistance (%)	32.6	30.4	12.8	8.81	8.63	8.75	8.76
Sales of space heating units - Gas (%)	27	14.4	4.38	2.16	2.08	2.05	2.05
Sales of space heating units - Fossil (%)	6.33	6.33	2.2	1.25	1.2	1.18	1.18
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.3	75.9	76.4	76.4	76.4
Sales of water heating units - Electric Resistance (%)	72.5	72.8	30.8	21.4	21	21	21
Sales of water heating units - Gas Furnace (%)	23.5	12.5	2.34	0.099	0	0	0
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.62	2.63	2.63	2.64
Sales of cooking units - Electric Resistance (%)	83.7	87.1	97.8	99.9	100	100	100
Sales of cooking units - Gas (%)	16.3	12.9	2.2	0.111	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		3.86	4.57				

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 (%)	11.7	29.4	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.92	6.27	6.62	6.6	6.56
Sales of space heating units - Gas Furnace (%)	82.5	63.1	17.5	2.95	1.48	1.44	1.44
Sales of space heating units - Fossil (%)	0	2.9	0.562	0.024	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.191	10.6	55.6	65.6	66.1	66.1	66.1
Sales of water heating units - Electric Resistance (%)	7.05	10.1	28.1	32.2	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	90.8	77.7	14.7	0.619	0	0	0
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		13,557	15,391				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,966	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	12,172	16,684	17,780	20,110	19,528	18,864	17,753
Installed thermal - Nuclear (MW)	5,270	5,270	5,270	5,270	5,270	1,776	888
Installed renewables - Rooftop PV (MW)	15.5	25	35.4	50.4	71.6	98.9	134
Installed renewables - Solar - Base land use assumptions (MW)	335	335	7,425	14,948	23,422	41,407	64,744
Installed renewables - Solar - Constrained land use assumptions (MW)	335	335	4,322	12,056	20,184	41,282	65,119
Capital invested - Solar PV - Base (billion \$2018)		0	8.49	8.3	8.81	17.6	21.6
Capital invested - Solar PV - Constrained (billion \$2018)		0.546	5.41	8.67	9.99	17.4	20.8
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0	0.009	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	0	11.9	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)	762	762	14,423	28,932	45,233	79,691	124,456
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	762	762	8,438	23,326	38,878	79,153	124,840
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	13,376	13,376	13,376
Biomass w/ccu allam power plant (GWh)	0	0	0	0	8.94	8.94	8.94

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	10	10	10
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	4	4	11	11
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	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	3,509	10,945	7,022	0
Biomass purchases (million \$2018/y)		0	0	184	681	1,049	1,049

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	10.3	22.7	36	37.5
Annual - BECCS (MMT)		0	0	4.51	17.3	26.4	26.3
Annual - NGCC (MMT)		0	0	2.46	2.07	2.77	4.1
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	6.84	7.07
Cumulative - All (MMT)		0	3.24	13.6	36.2	72.2	110
Cumulative - BECCS (MMT)		0	0	4.51	21.8	48.2	74.5
Cumulative - NGCC (MMT)		0	0	2.46	4.53	7.3	11.4
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	16.8	23.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	335	669	669	669	669
Spur (km)		0	313	1,922	3,063	3,862	4,205

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

Item	2020	2025	2030	2035	2040	2045	2050
All (km)		0	648	2,591	3,732	4,532	4,874
Cumulative investment - Trunk (million \$2018)		0	1,872	3,743	3,743	3,743	3,743
Cumulative investment - Spur (million \$2018)		0	222	1,248	2,405	3,157	3,361
Cumulative investment - All (million \$2018)		0	2,094	4,991	6,149	6,901	7,104

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	2.19	8.81	16.3	27.5	35.4
Injection wells (wells)		0	2	10	18	32	38
Resource characterization, appraisal, permitting costs (million \$2020)		14.6	263	417	417	417	417
Wells and facilities construction costs (million \$2020)		0	80.8	315	561	938	1,164

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)							-170
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-340
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786

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)							-57.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,171
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,257

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-57.1
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,340
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							528
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							52.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							614
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,003
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							106
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,142

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)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		19.5	12.9	5.33	2.12	0.677	0.397
Premature deaths from air pollution - Mobile - On-Road (deaths)		113	113	109	97.7	77.3	52.6
Premature deaths from air pollution - Gas Stations (deaths)		9.95	9.96	9.54	8.48	6.69	4.59
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		9.02	8.05	7.02	5.74	4.3	2.91
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.583	0.545	0.509	0.442	0.338	0.23
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.02	1.99	1.92	1.72	1.35	0.958
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.67	1.59	1.5	1.41	1.31	1.22
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.32	5.2	4.94	4.35	3.49	2.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.966	0.876	0.79	0.68	0.56	0.447
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.566	0.507	0.45	0.394	0.34	0.29
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		18.7	15	15	15	15.2	15
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.2	41.6	34.7	29.2	25.2	17.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		354	0.481	0.436	0.278	0.172	0.012
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		173	114	47.3	18.7	6	3.52
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,002	1,004	970	869	687	468
Monetary damages from air pollution - Gas Stations (million \$2019)		88.1	88.2	84.5	75.1	59.3	40.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		79.9	71.4	62.2	50.9	38.1	25.8
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		5.17	4.83	4.51	3.92	2.99	2.04
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		17.9	17.6	17	15.3	12	8.49
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14.8	14.1	13.3	12.5	11.6	10.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		47.1	46	43.7	38.5	30.9	23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		8.55	7.75	6.99	6.02	4.96	3.96
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.01	4.49	3.98	3.49	3.01	2.57
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		165	132	132	132	135	133
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		419	369	308	260	223	158

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		253	324	1,077	1,898	2,008	1,174
By economic sector - Construction (jobs)		5,832	13,147	14,234	15,836	25,674	30,398
By economic sector - Manufacturing (jobs)		4,194	4,612	5,221	5,983	7,021	7,198
By economic sector - Mining (jobs)		5,205	3,878	3,028	2,309	1,862	1,279
By economic sector - Other (jobs)		288	1,628	1,668	2,240	4,782	6,365
By economic sector - Pipeline (jobs)		669	978	1,137	878	901	956
By economic sector - Professional (jobs)		3,825	5,573	6,671	9,254	13,552	14,208

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		2,922	3,995	4,188	5,237	8,222	9,518
By economic sector - Utilities (jobs)		10,426	13,084	15,570	16,125	21,366	24,728
By resource sector - Biomass (jobs)		959	871	3,576	7,984	8,551	4,842
By resource sector - CO2 (jobs)		6.76	3,786	6,075	4,507	5,405	6,547
By resource sector - Coal (jobs)		3,293	1,809	1,499	1,314	1,185	1,044
By resource sector - Grid (jobs)		10,169	13,922	17,455	20,538	33,442	40,911
By resource sector - Natural Gas (jobs)		8,949	7,082	6,080	5,811	4,544	3,939
By resource sector - Nuclear (jobs)		2,660	2,618	2,576	2,081	1,001	414
By resource sector - Oil (jobs)		6,294	5,425	4,694	3,918	3,151	1,913
By resource sector - Solar (jobs)		592	10,729	9,754	12,488	26,862	34,405
By resource sector - Wind (jobs)		691	978	1,084	1,119	1,245	1,808
By education level - All sectors - High school diploma or less (jobs)		13,971	20,132	22,675	25,708	36,823	41,233
By education level - All sectors - Associates degree or some college (jobs)		10,316	14,921	16,628	18,555	26,992	30,934
By education level - All sectors - Bachelors degree (jobs)		7,307	9,515	10,529	12,012	16,686	18,334
By education level - All sectors - Masters or professional degree (jobs)		1,781	2,326	2,598	3,030	4,245	4,645
By education level - All sectors - Doctoral degree (jobs)		240	325	364	454	641	678
Related work experience - All sectors - None (jobs)		4,766	6,840	7,727	8,778	12,612	14,204
Related work experience - All sectors - Up to 1 year (jobs)		6,470	9,371	10,570	12,244	17,603	19,579
Related work experience - All sectors - 1 to 4 years (jobs)		12,388	17,094	19,057	21,476	30,565	34,289
Related work experience - All sectors - 4 to 10 years (jobs)		7,860	11,021	12,246	13,706	19,591	22,116
Related work experience - All sectors - Over 10 years (jobs)		2,130	2,893	3,193	3,556	5,016	5,636
On-the-Job Training - All sectors - None (jobs)		1,783	2,537	2,805	3,233	4,660	5,207
On-the-Job Training - All sectors - Up to 1 year (jobs)		22,399	30,785	34,560	39,499	55,907	62,119
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,014	10,131	11,245	12,416	17,981	20,584
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,119	3,314	3,693	4,070	6,059	7,030
On-the-Job Training - All sectors - Over 10 years (jobs)		300	451	489	541	781	884
On-Site or In-Plant Training - All sectors - None (jobs)		5,294	7,537	8,435	9,651	13,804	15,423
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		20,389	28,071	31,446	35,812	50,796	56,604
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,448	7,839	8,708	9,651	13,961	15,939
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,213	3,366	3,744	4,129	6,072	6,989
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		270	406	460	515	756	870
Wage income - All (million \$2019)		1,800	2,477	2,801	3,188	4,554	5,157

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	546	513	465	427	397	363	322
Final energy use - Residential (PJ)	163	154	147	140	131	121	113
Final energy use - Commercial (PJ)	116	116	115	113	110	107	105
Final energy use - Industry (PJ)	551	582	616	613	638	655	660

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)		3.04	3.04	3.84	3.93	5.22	5.46

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	9.94	138	265	856	1,447	2,756	4,064
Vehicle stocks - LDV – All others (1000 units)	5,312	5,312	5,312	5,039	4,766	3,672	2,579
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	163	347	1,168	3,685	5,365
Public EV charging plugs - DC Fast (1000 units)	0.07		0.612		3.34		9.39
Public EV charging plugs - L2 (1000 units)	0.285		14.7		80.3		225

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 (%)	34.1	42.7	46.3	56.9	72.9	83.2	86.8
Sales of space heating units - Electric Resistance (%)	32.6	33.8	31.7	25.8	17	11.4	9.4
Sales of space heating units - Gas (%)	27	16.4	15.2	12.1	7.04	3.65	2.47
Sales of space heating units - Fossil (%)	6.33	7.13	6.71	5.24	3.12	1.79	1.34
Sales of water heating units - Electric Heat Pump (%)	0	2.09	8.02	25.1	51.3	68.4	74.3
Sales of water heating units - Electric Resistance (%)	72.5	80.9	76.2	62.3	41.2	27.4	22.6
Sales of water heating units - Gas Furnace (%)	23.5	14.4	13.2	9.97	4.91	1.56	0.408
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.64	2.65	2.64	2.64
Sales of cooking units - Electric Resistance (%)	83.6	84	85.5	89.5	95	98.4	99.6
Sales of cooking units - Gas (%)	16.4	16	14.5	10.5	5.01	1.62	0.435
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		3.81	4.31				

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 (%)	11.7	20.3	25.7	41.5	66.1	83.2	89.6
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.65	4.79	5.28	5.94	6.33
Sales of space heating units - Gas Furnace (%)	82.5	71.7	66.5	51.3	27.4	10.5	3.93
Sales of space heating units - Fossil (%)	0	3.35	3.16	2.4	1.19	0.387	0.102
Sales of water heating units - Electric Heat Pump (%)	0.191	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	7.05	6.58	8.46	14.5	23.6	29.5	31.6
Sales of water heating units - Gas Furnace (%)	90.8	89.9	82.9	62.1	30.4	9.73	2.53
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		13,551	15,374				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,966	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	12,572	16,324	16,188	15,400	12,554	11,637	13,232
Installed thermal - Nuclear (MW)	5,270	5,270	5,270	5,270	2,966	888	888

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)							-170
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-340
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249

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 - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786

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)							-57.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,171
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,257
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-57.1
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,340

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							528
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							52.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							614
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,003
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							106
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,142

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)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		23.4	17.6	9.74	5.9	1.29	0.446
Premature deaths from air pollution - Mobile - On-Road (deaths)		111	103	77.4	44.4	20	7.7
Premature deaths from air pollution - Gas Stations (deaths)		9.74	8.88	6.63	3.89	1.86	0.853
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.94	7.2	4.81	2.71	1.39	0.722
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.571	0.457	0.311	0.181	0.083	0.031
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2	1.75	1.31	0.841	0.438	0.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.67	1.59	1.5	1.41	1.31	1.22
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.28	4.61	3.4	2.16	1.32	0.844
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.963	0.796	0.62	0.45	0.307	0.195
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.566	0.473	0.384	0.298	0.217	0.142
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		19.5	14.9	15	14.9	15.2	14.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		46.3	42.8	35.7	25.3	14.8	1.84
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		354	0.481	0.436	0.278	0.172	0.012
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		207	156	86.3	52.2	11.5	3.95
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		985	912	688	394	178	68.5
Monetary damages from air pollution - Gas Stations (million \$2019)		86.3	78.6	58.7	34.4	16.5	7.56
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		79.3	63.8	42.6	24	12.3	6.39
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		5.06	4.05	2.75	1.61	0.733	0.273
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		17.7	15.5	11.6	7.46	3.88	1.77
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14.8	14.1	13.3	12.5	11.6	10.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46.7	40.8	30.1	19.1	11.7	7.47
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		8.53	7.05	5.49	3.98	2.72	1.73
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.01	4.19	3.4	2.64	1.92	1.26
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		172	132	132	132	134	131
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		411	380	317	225	132	16.4

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		209	433	629	1,025	1,255	1,170
By economic sector - Construction (jobs)		8,253	10,487	19,029	26,937	39,404	53,513
By economic sector - Manufacturing (jobs)		4,527	5,004	6,226	6,924	8,542	10,706
By economic sector - Mining (jobs)		5,158	3,678	2,611	1,691	1,062	567
By economic sector - Other (jobs)		672	1,255	3,385	5,630	9,393	13,225
By economic sector - Pipeline (jobs)		648	539	377	240	129	60.7
By economic sector - Professional (jobs)		4,734	5,331	8,654	12,592	18,910	25,694
By economic sector - Trade (jobs)		3,423	3,619	5,744	8,264	12,749	17,846
By economic sector - Utilities (jobs)		12,437	12,290	14,769	17,986	24,810	38,233
By resource sector - Biomass (jobs)		812	1,222	1,692	3,347	4,662	5,148
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		3,207	1,715	1,496	1,309	1,184	1,035
By resource sector - Grid (jobs)		13,425	15,223	22,398	31,565	46,940	74,927
By resource sector - Natural Gas (jobs)		9,766	7,879	6,292	5,346	4,006	3,892
By resource sector - Nuclear (jobs)		2,660	2,618	1,697	252	0	0
By resource sector - Oil (jobs)		6,245	5,134	3,899	2,414	1,254	175

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		3,197	7,758	22,236	35,254	56,194	73,012
By resource sector - Wind (jobs)		748	1,090	1,714	1,803	2,013	2,825
By education level - All sectors - High school diploma or less (jobs)		16,729	18,055	26,431	35,132	50,075	69,026
By education level - All sectors - Associates degree or some college (jobs)		12,469	13,334	19,529	26,038	37,420	52,208
By education level - All sectors - Bachelors degree (jobs)		8,498	8,785	12,025	15,579	22,200	30,708
By education level - All sectors - Masters or professional degree (jobs)		2,082	2,161	2,997	3,943	5,684	7,888
By education level - All sectors - Doctoral degree (jobs)		283	302	441	598	875	1,184
Related work experience - All sectors - None (jobs)		5,717	6,136	8,945	11,947	17,150	23,830
Related work experience - All sectors - Up to 1 year (jobs)		7,761	8,452	12,547	16,819	24,153	33,182
Related work experience - All sectors - 1 to 4 years (jobs)		14,687	15,493	22,068	29,069	41,502	57,541
Related work experience - All sectors - 4 to 10 years (jobs)		9,382	9,918	14,179	18,678	26,673	37,054
Related work experience - All sectors - Over 10 years (jobs)		2,513	2,638	3,684	4,775	6,775	9,407
On-the-Job Training - All sectors - None (jobs)		2,125	2,284	3,348	4,470	6,470	8,915
On-the-Job Training - All sectors - Up to 1 year (jobs)		26,472	28,076	40,048	52,831	75,420	104,228
On-the-Job Training - All sectors - 1 to 4 years (jobs)		8,467	9,017	13,093	17,332	24,776	34,525
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,636	2,863	4,344	5,883	8,486	11,855
On-the-Job Training - All sectors - Over 10 years (jobs)		362	397	590	774	1,101	1,492
On-Site or In-Plant Training - All sectors - None (jobs)		6,325	6,803	9,919	13,197	18,953	26,105
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		24,122	25,553	36,455	48,077	68,643	94,983
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,562	6,995	10,156	13,446	19,220	26,755
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,721	2,927	4,358	5,849	8,402	11,716
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		332	359	534	721	1,036	1,455
Wage income - All (million \$2019)		2,126	2,253	3,193	4,225	6,090	8,590

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	546	508	443	365	294	250	232
Final energy use - Residential (PJ)	163	153	141	126	114	108	105
Final energy use - Commercial (PJ)	116	116	112	106	101	99.4	100
Final energy use - Industry (PJ)	551	582	615	609	632	649	656

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		3.72	3.8	5.83	6.14	5	5.13

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	12.8	447	881	2,399	3,918	5,132	6,345
Vehicle stocks - LDV – All others (1000 units)	5,291	5,038	4,785	3,487	2,189	1,238	288
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,020	2,605	4,234	6,409	6,981	6,653
Public EV charging plugs - DC Fast (1000 units)	0.07		2.03		9.05		14.7
Public EV charging plugs - L2 (1000 units)	0.285		48.9		217		352

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 (%)	34.1	48.8	80.6	87.8	88.1	88	88
Sales of space heating units - Electric Resistance (%)	32.6	30.4	12.8	8.81	8.63	8.75	8.76
Sales of space heating units - Gas (%)	27	14.4	4.38	2.16	2.08	2.05	2.05
Sales of space heating units - Fossil (%)	6.33	6.33	2.2	1.25	1.2	1.18	1.18
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.3	75.9	76.4	76.4	76.4
Sales of water heating units - Electric Resistance (%)	72.5	72.8	30.8	21.4	21	21	21
Sales of water heating units - Gas Furnace (%)	23.5	12.5	2.34	0.099	0	0	0
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.62	2.63	2.63	2.64
Sales of cooking units - Electric Resistance (%)	83.7	87.1	97.8	99.9	100	100	100
Sales of cooking units - Gas (%)	16.3	12.9	2.2	0.111	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		3.86	4.57				

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 (%)	11.7	29.4	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.92	6.27	6.62	6.6	6.56
Sales of space heating units - Gas Furnace (%)	82.5	63.1	17.5	2.95	1.48	1.44	1.44
Sales of space heating units - Fossil (%)	0	2.9	0.562	0.024	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.191	10.6	55.6	65.6	66.1	66.1	66.1
Sales of water heating units - Electric Resistance (%)	7.05	10.1	28.1	32.2	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	90.8	77.7	14.7	0.619	0	0	0
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		13,557	15,391				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,966	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	12,572	21,918	21,742	21,044	14,535	14,965	20,267
Installed thermal - Nuclear (MW)	5,270	5,270	5,270	888	0	0	0

Table 34: E+RE+ scenario - PILLAR 2: Clean Electricity - Generating capacity (continued)

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Rooftop PV (MW)	15.5	25	35.4	50.4	71.6	98.9	134
Installed renewables - Solar - Base land use assumptions (MW)	335	2,122	6,743	23,201	46,907	83,108	141,243
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	0	2,629
Installed renewables - Solar - Constrained land use assumptions (MW)	335	335	6,585	22,239	47,339	80,041	137,772
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	2,253
Capital invested - Solar PV - Base (billion \$2018)		2.39	5.53	18.1	24.6	35.5	53.9
Capital invested - Offshore Wind - Base (billion \$2018)		0	0	0	0	0	3.29

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	762	4,206	13,083	44,797	90,138	159,581	271,134
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	7,836
Solar - Constrained land use assumptions (GWh)	1,525	1,525	25,563	85,807	181,940	307,228	528,729
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	13,386

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)							-170
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-340
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115

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 - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786

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)							-57.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,171
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,257
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-57.1
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,340
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							528
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							52.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							614
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,003
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							106
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,142

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)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		18.1	16.3	15	11.6	4.07	1.39
Premature deaths from air pollution - Mobile - On-Road (deaths)		111	103	77.4	44.4	20	7.7
Premature deaths from air pollution - Gas Stations (deaths)		9.74	8.88	6.63	3.89	1.86	0.853

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.94	7.2	4.81	2.71	1.39	0.722
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.571	0.457	0.311	0.181	0.083	0.031
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2	1.75	1.31	0.841	0.438	0.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.67	1.59	1.5	1.41	1.31	1.22
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.28	4.61	3.4	2.16	1.32	0.844
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.963	0.796	0.62	0.45	0.307	0.195
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.566	0.473	0.384	0.298	0.217	0.142
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		18.3	14.9	15	14.9	15.2	14.9
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		48	45.8	44.5	38	31.7	23.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		354	0.481	0.436	0.278	0.172	0.012
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		160	144	133	103	36.1	12.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		985	912	688	394	178	68.5
Monetary damages from air pollution - Gas Stations (million \$2019)		86.3	78.6	58.7	34.4	16.5	7.56
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		79.3	63.8	42.6	24	12.3	6.39
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		5.06	4.05	2.75	1.61	0.733	0.273
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		17.7	15.5	11.6	7.46	3.88	1.77
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14.8	14.1	13.3	12.5	11.6	10.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		46.7	40.8	30.1	19.1	11.7	7.47
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		8.53	7.05	5.49	3.98	2.72	1.73
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.01	4.19	3.4	2.64	1.92	1.26
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		162	132	132	132	135	131

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		426	407	395	338	281	209

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		237	340	1,081	1,552	1,638	1,176
By economic sector - Construction (jobs)		5,484	7,483	11,537	11,289	12,358	12,522
By economic sector - Manufacturing (jobs)		3,785	3,562	3,972	4,139	4,280	4,146
By economic sector - Mining (jobs)		5,176	3,990	3,176	2,291	1,788	1,299
By economic sector - Other (jobs)		252	355	875	1,083	1,196	886
By economic sector - Pipeline (jobs)		687	1,092	1,338	1,049	1,054	1,133
By economic sector - Professional (jobs)		3,512	3,390	5,419	6,354	7,468	7,676
By economic sector - Trade (jobs)		2,725	2,513	3,240	3,436	3,750	3,573
By economic sector - Utilities (jobs)		9,635	11,715	15,308	14,413	19,733	29,307
By resource sector - Biomass (jobs)		831	871	3,707	5,801	6,415	4,888
By resource sector - CO2 (jobs)		721	4,284	6,870	5,086	6,099	7,394
By resource sector - Coal (jobs)		3,066	1,714	1,496	1,309	1,185	1,035
By resource sector - Grid (jobs)		9,295	10,067	15,732	15,462	17,852	19,963
By resource sector - Natural Gas (jobs)		8,425	8,245	7,307	7,700	7,498	5,959
By resource sector - Nuclear (jobs)		2,660	2,618	2,576	2,081	6,944	18,315
By resource sector - Oil (jobs)		6,243	5,177	4,041	2,741	1,916	1,274
By resource sector - Solar (jobs)		463	1,082	3,943	4,981	4,993	2,635
By resource sector - Wind (jobs)		504	384	275	446	362	258
By education level - All sectors - High school diploma or less (jobs)		13,094	14,500	19,672	19,583	22,439	25,148
By education level - All sectors - Associates degree or some college (jobs)		9,627	10,822	14,475	14,243	16,541	18,963
By education level - All sectors - Bachelors degree (jobs)		6,872	7,163	9,219	9,157	11,066	13,625
By education level - All sectors - Masters or professional degree (jobs)		1,675	1,731	2,273	2,295	2,811	3,486
By education level - All sectors - Doctoral degree (jobs)		227	224	308	328	406	497
Related work experience - All sectors - None (jobs)		4,457	4,982	6,746	6,722	7,777	8,808
Related work experience - All sectors - Up to 1 year (jobs)		6,055	6,590	9,041	9,149	10,609	12,014
Related work experience - All sectors - 1 to 4 years (jobs)		11,621	12,599	16,647	16,457	19,239	22,411
Related work experience - All sectors - 4 to 10 years (jobs)		7,363	8,113	10,719	10,543	12,380	14,533
Related work experience - All sectors - Over 10 years (jobs)		1,999	2,157	2,794	2,735	3,258	3,953
On-the-Job Training - All sectors - None (jobs)		1,675	1,791	2,393	2,399	2,862	3,423
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,991	22,567	30,038	30,025	35,094	40,657
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,567	7,409	9,856	9,613	11,197	12,999
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,981	2,360	3,247	3,164	3,634	4,070
On-the-Job Training - All sectors - Over 10 years (jobs)		282	314	414	404	476	570
On-Site or In-Plant Training - All sectors - None (jobs)		4,957	5,404	7,267	7,281	8,582	10,048
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		19,113	20,589	27,357	27,263	31,863	36,966

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,102	5,722	7,615	7,445	8,651	9,998
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,072	2,431	3,303	3,217	3,711	4,207
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		250	295	405	400	456	500
Wage income - All (million \$2019)		1,690	1,858	2,473	2,470	2,972	3,623

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	546	508	443	365	294	250	232
Final energy use - Residential (PJ)	163	153	141	126	114	108	105
Final energy use - Commercial (PJ)	116	116	112	106	101	99.4	100
Final energy use - Industry (PJ)	551	582	615	609	632	649	656

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		3.72	3.8	5.83	6.14	5	5.13

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	12.8	447	881	2,399	3,918	5,132	6,345
Vehicle stocks - LDV – All others (1000 units)	5,291	5,038	4,785	3,487	2,189	1,238	288
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		1,020	2,605	4,234	6,409	6,981	6,653
Public EV charging plugs - DC Fast (1000 units)	0.07		2.03		9.05		14.7
Public EV charging plugs - L2 (1000 units)	0.285		48.9		217		352

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 (%)	34.1	48.8	80.6	87.8	88.1	88	88
Sales of space heating units - Electric Resistance (%)	32.6	30.4	12.8	8.81	8.63	8.75	8.76
Sales of space heating units - Gas (%)	27	14.4	4.38	2.16	2.08	2.05	2.05
Sales of space heating units - Fossil (%)	6.33	6.33	2.2	1.25	1.2	1.18	1.18
Sales of water heating units - Electric Heat Pump (%)	0	12.1	64.3	75.9	76.4	76.4	76.4
Sales of water heating units - Electric Resistance (%)	72.5	72.8	30.8	21.4	21	21	21
Sales of water heating units - Gas Furnace (%)	23.5	12.5	2.34	0.099	0	0	0
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.62	2.63	2.63	2.64
Sales of cooking units - Electric Resistance (%)	83.7	87.1	97.8	99.9	100	100	100
Sales of cooking units - Gas (%)	16.3	12.9	2.2	0.111	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		3.86	4.57				

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 (%)	11.7	29.4	77	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.92	6.27	6.62	6.6	6.56
Sales of space heating units - Gas Furnace (%)	82.5	63.1	17.5	2.95	1.48	1.44	1.44
Sales of space heating units - Fossil (%)	0	2.9	0.562	0.024	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.191	10.6	55.6	65.6	66.1	66.1	66.1
Sales of water heating units - Electric Resistance (%)	7.05	10.1	28.1	32.2	32.3	32.3	32.3
Sales of water heating units - Gas Furnace (%)	90.8	77.7	14.7	0.619	0	0	0
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57
Sales of cooking units - Electric Resistance (%)	43.5	55.3	83.4	88.9	89.2	89.2	89.1
Sales of cooking units - Gas (%)	56.5	44.7	16.6	11.1	10.8	10.8	10.9
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		13,557	15,391				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,966	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	12,252	11,504	13,287	15,496	13,077	19,510	20,254
Installed thermal - Nuclear (MW)	5,270	5,270	5,270	5,270	2,966	3,464	10,816
Installed renewables - Rooftop PV (MW)	15.5	25	35.4	50.4	71.6	98.9	134
Installed renewables - Solar - Base land use assumptions (MW)	335	335	911	3,967	8,338	12,056	12,056
Installed renewables - Solar - Constrained land use assumptions (MW)	335	335	960	2,883	6,556	9,960	11,277
Installed renewables - Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		0	0.69	3.37	4.54	3.65	0
Capital invested - Solar PV - Constrained (billion \$2018)		0	0.748	2.12	3.82	3.34	1.22

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	762	762	1,865	7,748	16,195	23,323	23,323
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	762	762	1,957	5,634	12,672	19,247	21,780
Wind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
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)							-170

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-340
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786

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)							-57.1
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,171
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-29.1
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,257
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-57.1
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,225
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-58.1
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,340
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							33
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							528
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							52.8
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							614
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							33

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,003
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							106
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,142

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)		39.9	0.054	0.049	0.031	0.019	0.001
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		24.3	15.6	6.62	4.15	2.09	0.857
Premature deaths from air pollution - Mobile - On-Road (deaths)		113	113	109	97.7	77.3	52.6
Premature deaths from air pollution - Gas Stations (deaths)		9.95	9.96	9.54	8.48	6.69	4.59
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		9.02	8.05	7.02	5.74	4.3	2.91
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.583	0.545	0.509	0.442	0.338	0.23
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		2.02	1.99	1.92	1.72	1.35	0.958
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.67	1.59	1.5	1.41	1.31	1.22
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.32	5.2	4.94	4.35	3.49	2.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.966	0.876	0.79	0.68	0.56	0.447
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.566	0.507	0.45	0.394	0.34	0.29
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		18.9	15	15	15	15.3	15.2
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.2	41.6	34.7	29.2	25.2	17.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		354	0.481	0.436	0.278	0.172	0.012
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		215	138	58.7	36.8	18.5	7.59
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,002	1,004	970	869	687	468
Monetary damages from air pollution - Gas Stations (million \$2019)		88.1	88.2	84.5	75.1	59.3	40.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		79.9	71.4	62.2	50.9	38.1	25.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		5.17	4.83	4.51	3.92	2.99	2.04
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		17.9	17.6	17	15.3	12	8.49
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		14.8	14.1	13.3	12.5	11.6	10.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		47.1	46	43.7	38.5	30.9	23
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		8.55	7.75	6.99	6.02	4.96	3.96
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.01	4.49	3.98	3.49	3.01	2.57
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		167	132	132	132	135	134
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		419	369	308	260	223	158

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		231	324	481	1,635	2,073	1,842
By economic sector - Construction (jobs)		6,503	13,581	13,169	13,400	19,458	27,218
By economic sector - Manufacturing (jobs)		4,391	4,766	4,631	4,925	5,869	6,650
By economic sector - Mining (jobs)		5,163	3,866	3,040	2,359	1,875	1,245
By economic sector - Other (jobs)		341	1,646	1,464	1,717	3,268	5,672
By economic sector - Pipeline (jobs)		662	988	1,162	901	910	963
By economic sector - Professional (jobs)		4,157	5,779	5,494	7,893	11,393	14,361
By economic sector - Trade (jobs)		3,051	4,095	3,751	4,511	6,512	8,949
By economic sector - Utilities (jobs)		11,794	14,093	14,763	14,699	17,658	21,552
By resource sector - Biomass (jobs)		920	872	1,627	6,864	9,592	8,689
By resource sector - CO2 (jobs)		6.79	3,865	6,224	4,638	5,557	6,699
By resource sector - Coal (jobs)		3,133	1,715	1,499	1,314	1,189	1,053
By resource sector - Grid (jobs)		12,153	15,151	16,288	17,568	25,591	34,576
By resource sector - Natural Gas (jobs)		9,823	7,903	5,608	5,541	4,111	3,288
By resource sector - Nuclear (jobs)		2,660	2,618	2,576	2,308	1,322	414
By resource sector - Oil (jobs)		6,294	5,425	4,694	4,032	3,172	1,811
By resource sector - Solar (jobs)		584	10,577	8,500	9,194	17,748	30,736
By resource sector - Wind (jobs)		719	1,011	939	582	733	1,187
By education level - All sectors - High school diploma or less (jobs)		15,059	20,919	20,509	22,330	29,711	38,072
By education level - All sectors - Associates degree or some college (jobs)		11,233	15,577	15,252	16,115	21,533	28,158
By education level - All sectors - Bachelors degree (jobs)		7,832	9,887	9,545	10,544	13,731	17,165
By education level - All sectors - Masters or professional degree (jobs)		1,914	2,418	2,332	2,656	3,504	4,391
By education level - All sectors - Doctoral degree (jobs)		256	335	316	395	537	667
Related work experience - All sectors - None (jobs)		5,167	7,128	7,004	7,638	10,182	13,109

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Up to 1 year (jobs)		6,958	9,719	9,479	10,593	14,255	18,277
Related work experience - All sectors - 1 to 4 years (jobs)		13,358	17,790	17,336	18,741	24,719	31,601
Related work experience - All sectors - 4 to 10 years (jobs)		8,513	11,487	11,206	11,962	15,799	20,297
Related work experience - All sectors - Over 10 years (jobs)		2,297	3,012	2,929	3,108	4,060	5,168
On-the-Job Training - All sectors - None (jobs)		1,913	2,629	2,536	2,809	3,771	4,856
On-the-Job Training - All sectors - Up to 1 year (jobs)		24,093	32,002	31,206	34,408	45,491	57,754
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,633	10,573	10,351	10,816	14,346	18,681
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,332	3,466	3,412	3,540	4,787	6,352
On-the-Job Training - All sectors - Over 10 years (jobs)		322	467	449	468	621	809
On-Site or In-Plant Training - All sectors - None (jobs)		5,709	7,832	7,609	8,377	11,160	14,319
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		21,943	29,187	28,466	31,210	41,269	52,505
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,918	8,175	8,000	8,405	11,153	14,495
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,426	3,518	3,457	3,602	4,830	6,342
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		297	426	423	448	604	792
Wage income - All (million \$2019)		1,943	2,581	2,553	2,794	3,704	4,759

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	546	513	465	427	397	363	322
Final energy use - Residential (PJ)	163	154	147	140	131	121	113
Final energy use - Commercial (PJ)	116	116	115	113	110	107	105
Final energy use - Industry (PJ)	551	582	616	613	638	655	660

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)		3.04	3.04	3.84	3.93	5.22	5.46

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	9.94	138	265	856	1,447	2,756	4,064
Vehicle stocks - LDV – All others (1000 units)	5,312	5,312	5,312	5,039	4,766	3,672	2,579
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	163	347	1,168	3,685	5,365
Public EV charging plugs - DC Fast (1000 units)	0.07		0.612		3.34		9.39
Public EV charging plugs - L2 (1000 units)	0.285		14.7		80.3		225

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 (%)	34.1	42.7	46.3	56.9	72.9	83.2	86.8
Sales of space heating units - Electric Resistance (%)	32.6	33.8	31.7	25.8	17	11.4	9.4
Sales of space heating units - Gas (%)	27	16.4	15.2	12.1	7.04	3.65	2.47
Sales of space heating units - Fossil (%)	6.33	7.13	6.71	5.24	3.12	1.79	1.34
Sales of water heating units - Electric Heat Pump (%)	0	2.09	8.02	25.1	51.3	68.4	74.3
Sales of water heating units - Electric Resistance (%)	72.5	80.9	76.2	62.3	41.2	27.4	22.6
Sales of water heating units - Gas Furnace (%)	23.5	14.4	13.2	9.97	4.91	1.56	0.408
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.64	2.65	2.64	2.64
Sales of cooking units - Electric Resistance (%)	83.6	84	85.5	89.5	95	98.4	99.6
Sales of cooking units - Gas (%)	16.4	16	14.5	10.5	5.01	1.62	0.435
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		3.81	4.31				

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 (%)	11.7	20.3	25.7	41.5	66.1	83.2	89.6
Sales of space heating units - Electric Resistance (%)	5.83	4.63	4.65	4.79	5.28	5.94	6.33
Sales of space heating units - Gas Furnace (%)	82.5	71.7	66.5	51.3	27.4	10.5	3.93
Sales of space heating units - Fossil (%)	0	3.35	3.16	2.4	1.19	0.387	0.102
Sales of water heating units - Electric Heat Pump (%)	0.191	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	7.05	6.58	8.46	14.5	23.6	29.5	31.6
Sales of water heating units - Gas Furnace (%)	90.8	89.9	82.9	62.1	30.4	9.73	2.53
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57
Sales of cooking units - Electric Resistance (%)	43.5	47.1	51.3	61.6	76.1	85	88
Sales of cooking units - Gas (%)	56.5	52.9	48.7	38.4	23.9	15	12
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		13,551	15,374				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,966	706	0	0	0	0	0
Installed thermal - Natural gas (MW)	12,492	21,550	19,073	15,754	11,207	8,808	9,072
Installed thermal - Nuclear (MW)	5,270	5,270	5,270	5,270	4,118	888	888
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
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0	7.01	16.4	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	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	7,863	26,215	26,215	26,215

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

Item	2020	2025	2030	2035	2040	2045	2050
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	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	6	20	20	20
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	10	21	21
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	1	2	2	2
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	0	6,531	22,561	9,661	0
Biomass purchases (million \$2018/y)		0	0	479	2,220	3,039	3,039

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.24	11.2	39.1	55	55.8
Annual - BECCS (MMT)		0	0	7.89	35.8	48.2	48.1
Annual - NGCC (MMT)		0	0	0	0	0	0.69
Annual - Cement and lime (MMT)		0	3.24	3.35	3.32	6.84	7.07
Cumulative - All (MMT)		0	3.24	14.5	53.6	109	164
Cumulative - BECCS (MMT)		0	0	7.89	43.6	91.8	140
Cumulative - NGCC (MMT)		0	0	0	0	0	0.69
Cumulative - Cement and lime (MMT)		0	3.24	6.59	9.91	16.8	23.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	335	669	669	669	669
Spur (km)		0	313	1,335	2,177	3,443	3,639
All (km)		0	648	2,004	2,846	4,113	4,308
Cumulative investment - Trunk (million \$2018)		0	1,872	3,743	3,869	3,869	3,869
Cumulative investment - Spur (million \$2018)		0	221	1,388	2,806	4,123	4,183
Cumulative investment - All (million \$2018)		0	2,093	5,131	6,675	7,991	8,051

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	3.69	15	30.9	43.3	46.8
Injection wells (wells)		0	4	14	26	44	56
Resource characterization, appraisal, permitting costs (million \$2020)		14.6	361	580	580	580	580
Wells and facilities construction costs (million \$2020)		0	114	446	795	1,330	1,651

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)							-170
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-39,107
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-340
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-7,006
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-58,635
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,558

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786

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)							-216
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,085
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-26.6
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,328
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-216
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,063
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-53.1
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)							-2,332

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							118
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							485
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							48.3
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							45.6
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							327
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,024
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							118
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							2,276
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							96.7
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							45.6
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							327
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,863

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)		163	110	84.2	74	69.8	69.4
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		23.3	24.2	25	27.9	27.4	29.6
Premature deaths from air pollution - Mobile - On-Road (deaths)		113	114	116	119	121	124
Premature deaths from air pollution - Gas Stations (deaths)		9.91	10	10.1	10.3	10.4	10.6
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		8.85	7.88	7.03	6.5	6.25	6.06
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		0.571	0.482	0.355	0.24	0.154	0.104
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.9	1.81	1.74	1.72	1.71	1.68
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.75	1.74	1.72	1.7	1.68	1.64

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		5.34	5.16	4.68	4.19	3.96	4.01
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		1	0.986	0.952	0.9	0.859	0.838
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		0.592	0.602	0.612	0.621	0.63	0.64
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		25.7	21.5	19.9	19.5	19.6	19.1
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		47.5	50.3	51.5	49	48.8	46.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		1,443	978	747	655	619	615
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		206	214	222	247	242	262
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		1,001	1,017	1,034	1,055	1,077	1,099
Monetary damages from air pollution - Gas Stations (million \$2019)		87.8	88.9	89.7	91.2	92.5	93.5
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		78.5	69.8	62.3	57.6	55.4	53.7
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		5.06	4.27	3.14	2.13	1.36	0.921
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		16.9	16	15.5	15.3	15.1	14.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		15.5	15.4	15.3	15.1	14.8	14.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		47.3	45.6	41.5	37.1	35	35.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		8.86	8.73	8.43	7.97	7.61	7.42
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		5.24	5.32	5.42	5.5	5.57	5.66
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		227	189	175	172	173	168
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		422	446	458	436	433	409

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		219	197	194	158	158	171
By economic sector - Construction (jobs)		6,749	7,057	7,393	6,878	7,840	8,489
By economic sector - Manufacturing (jobs)		3,544	3,624	3,659	3,576	3,630	3,654
By economic sector - Mining (jobs)		5,828	4,622	3,771	2,984	2,506	2,036

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Other (jobs)		335	349	366	344	403	451
By economic sector - Pipeline (jobs)		683	718	731	685	691	680
By economic sector - Professional (jobs)		4,362	4,100	3,994	3,594	3,716	3,765
By economic sector - Trade (jobs)		3,355	3,026	2,838	2,491	2,550	2,545
By economic sector - Utilities (jobs)		12,431	12,467	12,812	11,656	12,640	13,410
By resource sector - Biomass (jobs)		846	792	736	658	673	684
By resource sector - CO2 (jobs)		0	0.024	0.03	0.032	0.036	0.038
By resource sector - Coal (jobs)		4,499	3,178	2,685	1,941	1,488	1,297
By resource sector - Grid (jobs)		13,376	13,749	14,368	12,001	14,592	16,546
By resource sector - Natural Gas (jobs)		9,783	9,978	10,039	10,581	11,277	10,885
By resource sector - Nuclear (jobs)		2,660	2,618	2,576	2,081	1,405	1,383
By resource sector - Oil (jobs)		6,318	5,497	4,886	4,460	4,165	3,792
By resource sector - Solar (jobs)			207	295	296	313	465
By resource sector - Wind (jobs)		23.6	140	172	350	220	151
By education level - All sectors - High school diploma or less (jobs)		15,660	15,088	14,941	13,513	14,363	14,897
By education level - All sectors - Associates degree or some college (jobs)		11,590	11,277	11,242	10,250	10,932	11,328
By education level - All sectors - Bachelors degree (jobs)		8,021	7,667	7,499	6,745	6,936	7,048
By education level - All sectors - Masters or professional degree (jobs)		1,971	1,879	1,835	1,644	1,687	1,714
By education level - All sectors - Doctoral degree (jobs)		264	249	240	214	215	215
Related work experience - All sectors - None (jobs)		5,334	5,176	5,147	4,680	4,980	5,159
Related work experience - All sectors - Up to 1 year (jobs)		7,206	6,912	6,815	6,137	6,475	6,700
Related work experience - All sectors - 1 to 4 years (jobs)		13,848	13,305	13,125	11,863	12,473	12,832
Related work experience - All sectors - 4 to 10 years (jobs)		8,771	8,497	8,427	7,653	8,079	8,326
Related work experience - All sectors - Over 10 years (jobs)		2,347	2,270	2,244	2,032	2,126	2,185
On-the-Job Training - All sectors - None (jobs)		1,965	1,885	1,851	1,663	1,728	1,773
On-the-Job Training - All sectors - Up to 1 year (jobs)		24,883	23,867	23,503	21,208	22,243	22,879
On-the-Job Training - All sectors - 1 to 4 years (jobs)		7,894	7,685	7,662	6,980	7,440	7,710
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,441	2,407	2,428	2,228	2,421	2,532
On-the-Job Training - All sectors - Over 10 years (jobs)		323	316	314	287	300	309
On-Site or In-Plant Training - All sectors - None (jobs)		5,841	5,641	5,575	5,049	5,291	5,443
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		22,704	21,776	21,450	19,353	20,320	20,914
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		6,125	5,951	5,925	5,390	5,740	5,946
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,530	2,488	2,501	2,291	2,473	2,576
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		306	304	307	283	309	323
Wage income - All (million \$2019)		2,011	1,963	1,965	1,800	1,915	1,997

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	546	512	468	441	440	453	469

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Residential (PJ)	163	154	151	149	149	150	153
Final energy use - Commercial (PJ)	116	118	119	119	120	124	129
Final energy use - Industry (PJ)	551	594	623	639	664	684	709

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)		4.01	4.13	5.56	5.83	5.01	5.15

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 (%)	32.1	57	57.8	59.1	60.4	62.1	64.7
Sales of space heating units - Electric Resistance (%)	33.6	26.8	26.4	25.6	24.5	23	20.3
Sales of space heating units - Gas (%)	27.8	12.1	11.7	11.3	11.2	11.1	11.1
Sales of space heating units - Fossil (%)	6.48	4.04	4.09	4.01	3.92	3.88	3.9
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	72.5	82.6	82.7	82.5	82.4	82.4	82.3
Sales of water heating units - Gas Furnace (%)	23.5	14.8	14.7	14.9	15	15	15
Sales of water heating units - Other (%)	3.93	2.64	2.61	2.64	2.66	2.66	2.66
Sales of cooking units - Electric Resistance (%)	83.5	83.5	83.5	83.5	83.5	83.5	83.5
Sales of cooking units - Gas (%)	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		3.76	3.8				

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 (%)	11.7	32	71.2	79	79.3	79.3	79.4
Sales of space heating units - Electric Resistance (%)	5.83	6.42	12	15.8	18.7	19.2	19.2
Sales of space heating units - Gas Furnace (%)	82.5	58.9	16.3	5.24	1.95	1.49	1.44
Sales of space heating units - Fossil (%)	0	2.68	0.471	0.024	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.191	0.157	0.15	0.153	0.152	0.148	0.15
Sales of water heating units - Electric Resistance (%)	7.05	5.85	5.67	5.75	5.7	5.62	5.68
Sales of water heating units - Gas Furnace (%)	90.8	92.4	92.6	92.5	92.6	92.7	92.6
Sales of water heating units - Other (%)	1.97	1.59	1.58	1.59	1.59	1.58	1.57
Sales of cooking units - Electric Resistance (%)	43.5	45.6	45.9	45.7	46	45.9	45.7
Sales of cooking units - Gas (%)	56.5	54.4	54.1	54.3	54	54.1	54.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		13,308	13,855				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	4,966	2,116	2,116	2,116	0	0	0
Installed thermal - Natural gas (MW)	12,172	20,490	21,782	21,004	19,787	28,937	33,926

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Nuclear (MW)	5,270	5,270	5,270	5,270	2,966	2,966	2,966
Installed renewables - Rooftop PV (MW)	15.5	25	35.4	50.4	71.6	98.9	134
Installed renewables - Solar - Base land use assumptions (MW)	335	335	335	335	335	335	335

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	762	762	762	762	762	762	762
Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
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)	-56.9		-17.8				-14.4
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-6.11		-10.2				-10.7
Business-as-usual carbon sink - Total (Mt CO2e/y)	-63		-28				-25.1

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)							-170
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,448
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-3,133
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-7,484
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-207
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-1,524
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-531
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,873
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-19,687
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-255
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,110
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,014
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-4,591
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-14,968
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-400
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-2,286

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-3,768
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-3,715
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-39,107
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-340
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-1,902
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-11,580
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-6,158
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-22,452
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-592
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-3,048
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-7,006
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-58,635
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-5,558
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							27.8
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,262
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							1,134
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)							29.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							34.5
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,115
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,946
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							41.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,084
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,707
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)							42.9
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							151
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							249
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,245
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,770
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							55.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							5,905
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							2,269
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)							56.3
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							201
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							199
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,842
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							10,786