Net-Zero America - Tennessee data

October 29, 2021 (updated November 17, 2023)

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		26.1	18.6	10.6	8.51	3.48	1.37
Premature deaths from air pollution - Mobile - On-Road (deaths)		173	161	123	71.1	32.7	13.3
Premature deaths from air pollution - Gas Stations (deaths)		18.7	17.1	12.9	7.58	3.67	1.72
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.3	14.1	9.41	5.22	2.55	1.18
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.52	1.21	0.813	0.47	0.211	0.075
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.46	3.07	2.32	1.49	0.767	0.335
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.38	3.21	3.03	2.84	2.65	2.45
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		15.1	13.2	9.74	6.29	4.07	2.91
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.33	1.95	1.53	1.11	0.759	0.483
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.01	0.845	0.688	0.536	0.393	0.259
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.72	0.874	0.859	0.837	0.839	0.822
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62.3	58.3	52.7	41	30.2	18.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		678	0.891	0.866	0.635	0.43	0.035
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		231	165	93.7	75.4	30.8	12.1
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,540	1,435	1,091	632	291	118
Monetary damages from air pollution - Gas Stations (million $2019)		166	152	114	67.1	32.5	15.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		153	125	83.4	46.3	22.6	10.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.5	10.7	7.2	4.16	1.87	0.668
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		30.6	27.2	20.6	13.2	6.79	2.97
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		29.9	28.4	26.8	25.1	23.4	21.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		133	117	86.3	55.7	36	25.8

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)		20.7	17.3	13.6	9.86	6.72	4.27
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		8.93	7.48	6.09	4.75	3.48	2.29
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		15.2	7.71	7.58	7.39	7.4	7.26
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		553	517	468	364	268	166

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		446	511	888	614	777	586
By economic sector - Construction (jobs)		4,908	5,306	6,808	7,592	9,699	13,910
By economic sector - Manufacturing (jobs)		2,866	2,944	3,428	3,138	2,811	3,258
By economic sector - Mining (jobs)		2,237	1,603	1,043	637	388	238
By economic sector - Other (jobs)		337	397	631	1,000	1,789	3,143
By economic sector - Pipeline (jobs)		452	517	487	296	258	237
By economic sector - Professional (jobs)		2,668	2,471	3,340	3,698	5,146	7,108
By economic sector - Trade (jobs)		2,310	2,015	2,131	2,295	3,076	4,623
By economic sector - Utilities (jobs)		7,759	7,753	9,527	9,650	9,611	12,067
By resource sector - Biomass (jobs)		1,166	1,223	2,297	1,712	2,853	2,565
By resource sector - CO2 (jobs)		13.5	1,134	1,618	735	1,111	1,373
By resource sector - Coal (jobs)		519	20.5	17.8	15.6	14.1	12.5
By resource sector - Grid (jobs)		7,990	8,104	11,539	12,813	13,557	18,310
By resource sector - Natural Gas (jobs)		4,373	3,586	3,247	2,992	1,666	1,688
By resource sector - Nuclear (jobs)		2,514	2,474	2,435	2,397	2,359	2,323
By resource sector - Oil (jobs)		5,546	4,342	3,023	1,949	1,189	650
By resource sector - Solar (jobs)		1,354	1,899	3,132	5,342	10,018	17,208
By resource sector - Wind (jobs)		507	734	973	963	786	1,040
By education level - All sectors - High school diploma or less (jobs)		10,035	10,000	12,168	12,352	14,326	19,186
By education level - All sectors - Associates degree or some college (jobs)		7,275	7,212	8,766	9,100	10,545	14,434
By education level - All sectors - Bachelors degree (jobs)		5,231	4,948	5,745	5,817	6,713	8,917
By education level - All sectors - Masters or professional degree (jobs)		1,270	1,196	1,413	1,449	1,713	2,289
By education level - All sectors - Doctoral degree (jobs)		172	159	191	200	257	345
Related work experience - All sectors - None (jobs)		3,472	3,428	4,156	4,240	4,925	6,648
Related work experience - All sectors - Up to 1 year (jobs)		4,729	4,695	5,728	5,836	6,879	9,247
Related work experience - All sectors - 1 to 4 years (jobs)		8,697	8,478	10,153	10,383	12,026	16,172
Related work experience - All sectors - 4 to 10 years (jobs)		5,581	5,451	6,517	6,693	7,719	10,424
Related work experience - All sectors - Over 10 years (jobs)		1,505	1,464	1,731	1,766	2,004	2,681
On-the-Job Training - All sectors - None (jobs)		1,325	1,281	1,512	1,556	1,852	2,516
On-the-Job Training - All sectors - Up to 1 year (jobs)		15,990	15,600	18,710	18,989	22,006	29,405

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)		4,931	4,888	5,915	6,121	7,049	9,594
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,517	1,529	1,888	1,987	2,337	3,235
On-the-Job Training - All sectors - Over 10 years (jobs)		220	219	259	267	310	421
On-Site or In-Plant Training - All sectors - None (jobs)		3,838	3,752	4,521	4,640	5,462	7,365
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		14,522	14,181	16,993	17,269	19,983	26,749
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,839	3,801	4,595	4,744	5,467	7,430
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,588	1,585	1,931	2,014	2,350	3,228
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		196	197	244	253	291	398
Wage income - All (million $2019)		1,276	1,255	1,511	1,556	1,806	2,441

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		123	105	78.9	54.7	35.5	20.6
Oil consumption - Cumulative (million bbls)							2,449
Oil production - Annual (million bbls)		0.272	0.273	0.273	0.216	0.176	0.117
Natural gas consumption - Annual (tcf)		303	256	205	154	97.1	67.4
Natural gas consumption - Cumulative (tcf)							6,175
Natural gas production - Annual (tcf)		4.04	3.82	3.33	2.81	2.23	1.73

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Commercial (PJ)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904

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)		4.81	4.94	6.83	7.17	5.85	5.99

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	42.4	513	983	2,630	4,277	5,593	6,909
Vehicle stocks - LDV – All others (1000 units)	5,761	5,485	5,210	3,797	2,383	1,348	313
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,105	2,839	4,591	6,958	7,569	7,219
Public EV charging plugs - DC Fast (1000 units)	0.165		2.15		9.36		15.1
Public EV charging plugs - L2 (1000 units)	0.888		51.7		225		363

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Sales of space heating units - Electric Resistance (%)	31.3	29.8	12.5	8.63	8.46	8.57	8.59
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of water heating units - Electric Heat Pump (%)	0	9.08	48.1	56.8	57.1	57.2	57.2
Sales of water heating units - Electric Resistance (%)	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Sales of water heating units - Gas Furnace (%)	27.4	14.7	2.75	0.116	0	0	0
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54
Sales of cooking units - Electric Resistance (%)	83.2	86.7	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.23	5.68				

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 (%)	9.56	30.6	77.3	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Sales of space heating units - Gas (%)	85.6	62	17.3	2.94	1.48	1.43	1.43
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Sales of water heating units - Electric Resistance (%)	5.74	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas (%)	92.5	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56
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)		19,412	22,037				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,610	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,054	9,667	8,705	10,922	10,114	7,630	6,034
Installed thermal - Nuclear (MW)	4,981	4,981	4,981	4,981	4,981	4,981	4,981
Installed renewables - Rooftop PV (MW)	127	205	290	412	585	809	1,096
Installed renewables - Solar - Base land use assumptions (MW)	260	532	1,089	2,367	5,134	12,099	23,955
Installed renewables - Wind - Base land use assumptions (MW)	29	75.6	115	115	115	115	115
Installed renewables - Solar - Constrained land use assumptions (MW)	160	160	313	2,907	5,809	11,573	18,894
Installed renewables - Wind - Constrained land use assumptions (MW)	29	29	29	29	29	29	29
Capital invested - Solar PV - Base (billion $2018)		0.364	0.667	1.41	2.88	6.84	11
Capital invested - Wind - Base (billion $2018)		0.069	0.052	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 - Solar PV - Constrained (billion $2018)		0.173	0	1.86	2.57	9.47	7
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	0	0	3.78	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	538	1,056	2,116	4,533	9,759	22,749	44,773
Wind - Base land use assumptions (GWh)	106	245	361	361	361	361	361
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	282	282	575	5,431	10,875	21,631	35,152
Wind - Constrained land use assumptions (GWh)	106	106	106	106	106	106	106
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	0	0	0	4,245	4,245
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	0	0	0	2	2
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Beccs hydrogen (quantity)	0	0	0	3	3	7	7
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	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	3,213	0	6,799	0
Biomass purchases (million $2018/y)		0	0	170	170	506	506

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	5.99	5.7	17.2	16.5
Annual - BECCS (MMT)		0	0	4.13	4.13	12.5	12.5
Annual - NGCC (MMT)		0	0	1.86	1.57	4.69	4.06
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	0	5.99	11.7	28.9	45.4
Cumulative - BECCS (MMT)		0	0	4.13	8.26	20.7	33.2
Cumulative - NGCC (MMT)		0	0	1.86	3.43	8.12	12.2
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	181	362	362	362	362
Spur (km)		0	0	470	727	1,511	1,301
All (km)		0	181	832	1,089	1,872	1,662
Cumulative investment - Trunk (million $2018)		0	1,110	2,221	2,221	2,221	2,221
Cumulative investment - Spur (million $2018)		0	0	464	763	1,435	1,271
Cumulative investment - All (million $2018)		0	1,110	2,685	2,984	3,656	3,492

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	0.88	1.81	2.58	3.73
Injection wells (wells)		0	1	2	4	7	8
Resource characterization, appraisal, permitting costs (million $2020)		25.4	71.2	91.5	91.5	91.5	91.5
Wells and facilities construction costs (million $2020)		0	16.9	66	118	197	244

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)							-57.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039

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 - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
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)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209

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)							-274
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,769
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-54
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,097

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)							-274
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,357
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-108
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,739
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							965
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							98.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,176
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,832
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							197
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,141

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)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		19.8	12.3	5.08	2.09	0.743	0.475
Premature deaths from air pollution - Mobile - On-Road (deaths)		176	178	173	156	124	85.5
Premature deaths from air pollution - Gas Stations (deaths)		19.1	19.2	18.4	16.4	13	8.96
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	15.6	13.6	11.1	8.23	5.5
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.55	1.44	1.33	1.14	0.861	0.572
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.5	3.47	3.39	3.06	2.41	1.7
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.38	3.21	3.03	2.84	2.65	2.45
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		15.2	15	14.3	12.6	10.2	7.68

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)		2.34	2.16	1.98	1.72	1.41	1.12
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.01	0.906	0.807	0.709	0.615	0.527
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.67	0.876	0.867	0.85	0.84	0.797
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62.1	56	48.3	42	36.9	25.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		678	0.891	0.866	0.635	0.43	0.035
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		175	109	45	18.5	6.58	4.21
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,565	1,579	1,538	1,387	1,106	761
Monetary damages from air pollution - Gas Stations (million $2019)		169	170	163	145	115	79.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		154	139	121	98.2	73	48.7
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.8	12.8	11.8	10.1	7.63	5.07
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		31	30.8	30.1	27.2	21.4	15.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		29.9	28.4	26.8	25.1	23.4	21.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		134	133	127	112	90.4	68
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		20.7	19.1	17.5	15.2	12.5	9.95
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		8.93	8.02	7.14	6.27	5.44	4.66
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		14.7	7.73	7.65	7.5	7.41	7.03
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		551	497	429	373	328	230

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		460	481	1,281	907	1,064	586
By economic sector - Construction (jobs)		4,178	5,019	6,267	7,021	11,226	14,881
By economic sector - Manufacturing (jobs)		2,717	2,875	3,363	3,337	3,814	3,997
By economic sector - Mining (jobs)		2,261	1,689	1,278	942	691	434
By economic sector - Other (jobs)		284	358	532	878	1,961	3,211
By economic sector - Pipeline (jobs)		455	612	644	406	424	407
By economic sector - Professional (jobs)		2,302	2,155	3,526	4,049	6,339	7,346

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		2,146	1,933	2,230	2,491	3,766	4,876
By economic sector - Utilities (jobs)		6,261	6,829	8,181	8,277	10,767	12,951
By resource sector - Biomass (jobs)		1,186	1,135	3,846	3,438	4,529	2,481
By resource sector - CO2 (jobs)		13.7	1,934	2,777	1,270	1,906	2,343
By resource sector - Coal (jobs)		528	25.1	17.9	15.7	14.1	12.4
By resource sector - Grid (jobs)		5,663	6,190	7,808	10,196	15,000	19,182
By resource sector - Natural Gas (jobs)		3,608	2,774	2,894	2,210	1,901	1,877
By resource sector - Nuclear (jobs)		2,514	2,474	2,435	2,397	2,359	2,323
By resource sector - Oil (jobs)		5,614	4,681	3,916	3,111	2,329	1,373
By resource sector - Solar (jobs)		1,402	1,970	2,735	4,735	10,929	17,540
By resource sector - Wind (jobs)		534	768	873	937	1,084	1,558
By education level - All sectors - High school diploma or less (jobs)		8,838	9,377	11,828	12,128	17,130	20,727
By education level - All sectors - Associates degree or some college (jobs)		6,281	6,684	8,240	8,653	12,463	15,565
By education level - All sectors - Bachelors degree (jobs)		4,663	4,634	5,644	5,852	8,090	9,595
By education level - All sectors - Masters or professional degree (jobs)		1,125	1,108	1,391	1,461	2,056	2,439
By education level - All sectors - Doctoral degree (jobs)		155	148	199	215	312	363
Related work experience - All sectors - None (jobs)		3,035	3,196	4,020	4,141	5,880	7,167
Related work experience - All sectors - Up to 1 year (jobs)		4,193	4,403	5,619	5,811	8,252	9,940
Related work experience - All sectors - 1 to 4 years (jobs)		7,637	7,907	9,792	10,157	14,345	17,435
Related work experience - All sectors - 4 to 10 years (jobs)		4,873	5,077	6,222	6,483	9,184	11,246
Related work experience - All sectors - Over 10 years (jobs)		1,325	1,368	1,649	1,717	2,390	2,901
On-the-Job Training - All sectors - None (jobs)		1,184	1,206	1,486	1,559	2,219	2,697
On-the-Job Training - All sectors - Up to 1 year (jobs)		14,138	14,586	18,261	18,842	26,420	31,702
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,261	4,539	5,553	5,801	8,311	10,357
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,284	1,410	1,752	1,846	2,731	3,477
On-the-Job Training - All sectors - Over 10 years (jobs)		197	209	250	261	370	457
On-Site or In-Plant Training - All sectors - None (jobs)		3,389	3,509	4,411	4,584	6,525	7,918
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		12,823	13,257	16,522	17,072	23,958	28,843
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,328	3,535	4,332	4,521	6,462	8,022
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,356	1,468	1,809	1,894	2,763	3,476
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		167	182	227	238	344	430
Wage income - All (million $2019)		1,121	1,171	1,458	1,525	2,156	2,632

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	680	628	570	525	490	449	400
Final energy use - Residential (PJ)	260	244	232	219	204	187	173
Final energy use - Commercial (PJ)	171	171	169	166	161	156	153
Final energy use - Industry (PJ)	755	838	889	910	921	912	909

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)		4.14	4.18	4.77	4.88	5.83	6.04

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	32.8	171	309	950	1,590	3,008	4,425
Vehicle stocks - LDV – All others (1000 units)	5,784	5,784	5,784	5,487	5,189	3,999	2,808
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	180	376	1,271	3,991	5,817
Public EV charging plugs - DC Fast (1000 units)	0.165		0.677		3.48		9.69
Public EV charging plugs - L2 (1000 units)	0.888		16.3		83.7		233

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.2	41.6	45.3	56	72.3	82.8	86.5
Sales of space heating units - Electric Resistance (%)	31.3	33.1	31	25.2	16.6	11.1	9.21
Sales of space heating units - Gas (%)	32.4	20.3	18.9	14.9	8.67	4.49	3.04
Sales of space heating units - Fossil (%)	4.13	5	4.74	3.81	2.44	1.57	1.28
Sales of water heating units - Electric Heat Pump (%)	0	1.56	6	18.8	38.4	51.1	55.6
Sales of water heating units - Electric Resistance (%)	68.9	78.9	75.9	67	53.3	44.5	41.4
Sales of water heating units - Gas Furnace (%)	27.4	17	15.5	11.7	5.76	1.83	0.477
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.56	2.54	2.54
Sales of cooking units - Electric Resistance (%)	83.1	83.5	85.1	89.2	94.8	98.3	99.6
Sales of cooking units - Gas (%)	16.9	16.5	14.9	10.8	5.17	1.67	0.449
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.17	5.41				

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 (%)	9.56	21.7	26.9	42.4	66.6	83.3	89.7
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.65	4.78	5.23	5.91	6.33
Sales of space heating units - Gas (%)	85.6	70.4	65.3	50.5	27	10.4	3.89
Sales of space heating units - Fossil (%)	0	3.27	3.09	2.34	1.17	0.379	0.099
Sales of water heating units - Electric Heat Pump (%)	0.155	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	5.74	6.48	8.39	14.4	23.5	29.5	31.6
Sales of water heating units - Gas (%)	92.5	90	83	62.2	30.4	9.74	2.53
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56
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)		19,401	22,003				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,610	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,082	5,587	5,479	4,742	6,313	7,284	5,683
Installed thermal - Nuclear (MW)	4,981	4,981	4,981	4,981	4,981	4,981	4,981

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)							-57.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
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)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209

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)							-274
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,769
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-54
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,097
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,357
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-108
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,739
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							965

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 - Permanent conservation cover (1000 hectares)							98.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,176
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,832
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							197
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,141

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)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		21.2	15.1	7.9	4.95	1.39	0.523
Premature deaths from air pollution - Mobile - On-Road (deaths)		173	161	123	71.1	32.7	13.3
Premature deaths from air pollution - Gas Stations (deaths)		18.7	17.1	12.9	7.58	3.67	1.72
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.3	14.1	9.41	5.22	2.55	1.18
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.52	1.21	0.813	0.47	0.211	0.075
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.46	3.07	2.32	1.49	0.767	0.335
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.38	3.21	3.03	2.84	2.65	2.45
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		15.1	13.2	9.74	6.29	4.07	2.91
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.33	1.95	1.53	1.11	0.759	0.483
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.01	0.845	0.688	0.536	0.393	0.259
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.86	0.874	0.858	0.836	0.837	0.766
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		61.2	57.4	49.2	35.3	21.4	3.11
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		678	0.891	0.866	0.635	0.43	0.035

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		188	134	70	43.8	12.3	4.63
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,540	1,435	1,091	632	291	118
Monetary damages from air pollution - Gas Stations (million $2019)		166	152	114	67.1	32.5	15.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		153	125	83.4	46.3	22.6	10.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.5	10.7	7.2	4.16	1.87	0.668
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		30.6	27.2	20.6	13.2	6.79	2.97
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		29.9	28.4	26.8	25.1	23.4	21.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		133	117	86.3	55.7	36	25.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		20.7	17.3	13.6	9.86	6.72	4.27
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		8.93	7.48	6.09	4.75	3.48	2.29
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		16.4	7.71	7.57	7.37	7.39	6.76
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		543	510	437	314	190	27.6

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		447	514	848	577	668	586
By economic sector - Construction (jobs)		4,204	5,186	8,130	15,159	19,620	32,779
By economic sector - Manufacturing (jobs)		2,839	3,115	3,927	4,109	4,953	6,374
By economic sector - Mining (jobs)		2,214	1,548	937	487	198	28.4
By economic sector - Other (jobs)		253	530	1,211	3,208	4,557	8,505
By economic sector - Pipeline (jobs)		443	368	258	162	83.4	30.5
By economic sector - Professional (jobs)		2,349	2,556	4,009	6,972	9,460	15,837
By economic sector - Trade (jobs)		2,138	2,086	2,645	4,678	6,266	11,119
By economic sector - Utilities (jobs)		6,837	6,625	8,420	10,596	13,461	21,822
By resource sector - Biomass (jobs)		1,142	1,241	2,108	1,698	2,497	2,641
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		520	20.5	17.8	15.6	14.1	12.3
By resource sector - Grid (jobs)		6,667	7,342	11,527	16,616	24,301	41,572
By resource sector - Natural Gas (jobs)		3,784	3,049	2,337	2,154	1,433	2,085
By resource sector - Nuclear (jobs)		2,514	2,474	2,435	1,914	1,203	698
By resource sector - Oil (jobs)		5,547	4,282	2,893	1,651	702	4.64
By resource sector - Solar (jobs)		973	3,268	7,713	20,410	27,391	47,703
By resource sector - Wind (jobs)		575	852	1,351	1,489	1,725	2,365
By education level - All sectors - High school diploma or less (jobs)		9,094	9,607	13,124	19,760	25,433	41,441

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

Item	2020	2025	2030	2035	2040	2045	2050
By education level - All sectors - Associates degree or some college (jobs)		6,521	6,832	9,387	14,625	19,017	31,484
By education level - All sectors - Bachelors degree (jobs)		4,794	4,772	6,136	8,954	11,447	18,625
By education level - All sectors - Masters or professional degree (jobs)		1,158	1,157	1,519	2,264	2,923	4,798
By education level - All sectors - Doctoral degree (jobs)		157	160	218	345	447	733
Related work experience - All sectors - None (jobs)		3,134	3,264	4,436	6,738	8,724	14,352
Related work experience - All sectors - Up to 1 year (jobs)		4,299	4,575	6,295	9,545	12,293	20,030
Related work experience - All sectors - 1 to 4 years (jobs)		7,881	8,107	10,864	16,380	21,145	34,669
Related work experience - All sectors - 4 to 10 years (jobs)		5,039	5,182	6,943	10,559	13,615	22,356
Related work experience - All sectors - Over 10 years (jobs)		1,369	1,401	1,845	2,725	3,489	5,673
On-the-Job Training - All sectors - None (jobs)		1,209	1,251	1,671	2,574	3,308	5,437
On-the-Job Training - All sectors - Up to 1 year (jobs)		14,559	15,033	20,130	29,912	38,525	62,795
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,420	4,611	6,289	9,739	12,598	20,790
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,334	1,419	2,003	3,277	4,270	7,145
On-the-Job Training - All sectors - Over 10 years (jobs)		201	214	289	448	565	913
On-Site or In-Plant Training - All sectors - None (jobs)		3,483	3,627	4,924	7,516	9,690	15,849
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		13,211	13,644	18,263	27,204	35,041	57,194
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,448	3,599	4,900	7,555	9,772	16,105
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,406	1,476	2,040	3,270	4,240	7,060
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		174	184	256	402	525	873
Wage income - All (million $2019)		1,158	1,194	1,595	2,388	3,105	5,140

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Commercial (PJ)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904

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)		4.81	4.94	6.83	7.17	5.85	5.99

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	42.4	513	983	2,630	4,277	5,593	6,909
Vehicle stocks - LDV – All others (1000 units)	5,761	5,485	5,210	3,797	2,383	1,348	313

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

Item	2020	2025	2030	2035	2040	2045	2050
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,105	2,839	4,591	6,958	7,569	7,219
Public EV charging plugs - DC Fast (1000 units)	0.165		2.15		9.36		15.1
Public EV charging plugs - L2 (1000 units)	0.888		51.7		225		363

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Sales of space heating units - Electric Resistance (%)	31.3	29.8	12.5	8.63	8.46	8.57	8.59
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of water heating units - Electric Heat Pump (%)	0	9.08	48.1	56.8	57.1	57.2	57.2
Sales of water heating units - Electric Resistance (%)	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Sales of water heating units - Gas Furnace (%)	27.4	14.7	2.75	0.116	0	0	0
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54
Sales of cooking units - Electric Resistance (%)	83.2	86.7	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.23	5.68				

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 (%)	9.56	30.6	77.3	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Sales of space heating units - Gas (%)	85.6	62	17.3	2.94	1.48	1.43	1.43
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Sales of water heating units - Electric Resistance (%)	5.74	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas (%)	92.5	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56
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)		19,412	22,037				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,610	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,130	7,005	6,550	6,592	5,665	7,266	9,402
Installed thermal - Nuclear (MW)	4,981	4,981	4,981	4,981	2,540	2,540	0
Installed renewables - Rooftop PV (MW)	127	205	290	412	585	809	1,096
Installed renewables - Solar - Base land use assumptions (MW)	163	163	1,681	6,524	20,916	37,604	77,802
Installed renewables - Wind - Base land use assumptions (MW)	29	75.6	115	115	115	115	115

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Solar - Constrained land use assumptions (MW)	240	240	1,087	5,808	17,731	34,337	66,337
Installed renewables - Wind - Constrained land use assumptions (MW)	33.2	33.2	33.2	33.2	33.2	33.2	119
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	1.82	5.34	15	16.4	37.2
Capital invested - Wind - Base (billion $2018)		0.069	0.052	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	355	355	3,227	12,251	39,100	70,108	144,501
Wind - Base land use assumptions (GWh)	106	245	361	361	361	361	361
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	1,002	1,002	4,184	21,860	66,347	127,856	246,439
Wind - Constrained land use assumptions (GWh)	212	212	212	212	212	212	721
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-57.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2

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 - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
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)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209

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)							-274

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,769
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-54
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,097
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,357
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-108
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,739
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							965
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							98.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,176
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,832
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							197
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							2,141

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)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		24.1	17	17.6	13.5	4.64	1.51
Premature deaths from air pollution - Mobile - On-Road (deaths)		173	161	123	71.1	32.7	13.3
Premature deaths from air pollution - Gas Stations (deaths)		18.7	17.1	12.9	7.58	3.67	1.72
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.3	14.1	9.41	5.22	2.55	1.18
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.52	1.21	0.813	0.47	0.211	0.075

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.46	3.07	2.32	1.49	0.767	0.335
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.38	3.21	3.03	2.84	2.65	2.45
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		15.1	13.2	9.74	6.29	4.07	2.91
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.33	1.95	1.53	1.11	0.759	0.483
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.01	0.845	0.688	0.536	0.393	0.259
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.59	0.873	0.859	0.836	0.839	0.766
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		63	60.8	59.4	50.2	41.8	31
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		678	0.891	0.866	0.635	0.43	0.035
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		214	151	156	120	41.1	13.4
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,540	1,435	1,091	632	291	118
Monetary damages from air pollution - Gas Stations (million $2019)		166	152	114	67.1	32.5	15.3
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		153	125	83.4	46.3	22.6	10.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.5	10.7	7.2	4.16	1.87	0.668
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		30.6	27.2	20.6	13.2	6.79	2.97
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		29.9	28.4	26.8	25.1	23.4	21.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		133	117	86.3	55.7	36	25.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		20.7	17.3	13.6	9.86	6.72	4.27
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		8.93	7.48	6.09	4.75	3.48	2.29
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		14	7.7	7.58	7.38	7.4	6.76
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		560	540	527	446	371	275

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		455	486	1,291	776	867	586
By economic sector - Construction (jobs)		4,245	4,939	6,265	6,956	7,294	7,986
By economic sector - Manufacturing (jobs)		2,580	2,328	2,573	2,543	2,453	2,397
By economic sector - Mining (jobs)		2,253	1,646	1,138	748	523	384
By economic sector - Other (jobs)		255	268	372	609	693	778
By economic sector - Pipeline (jobs)		462	661	715	441	453	462
By economic sector - Professional (jobs)		2,327	2,121	3,406	3,601	4,365	4,898
By economic sector - Trade (jobs)		2,131	1,829	1,975	2,058	2,171	2,384
By economic sector - Utilities (jobs)		6,778	7,634	9,363	10,538	12,806	18,342
By resource sector - Biomass (jobs)		1,148	1,135	3,979	2,618	3,406	2,498
By resource sector - CO2 (jobs)		13.8	2,191	3,144	1,429	2,146	2,644
By resource sector - Coal (jobs)		518	20.5	17.8	15.6	14.1	12.3
By resource sector - Grid (jobs)		6,638	6,562	9,886	13,342	13,277	14,165
By resource sector - Natural Gas (jobs)		3,768	3,900	3,224	3,910	3,091	3,168
By resource sector - Nuclear (jobs)		2,514	2,474	2,435	2,397	5,469	11,794
By resource sector - Oil (jobs)		5,545	4,342	3,023	1,949	1,253	835
By resource sector - Solar (jobs)		943	964	1,137	2,218	2,625	2,826
By resource sector - Wind (jobs)		398	323	254	390	343	275
By education level - All sectors - High school diploma or less (jobs)		9,001	9,303	11,732	12,050	13,215	15,467
By education level - All sectors - Associates degree or some college (jobs)		6,440	6,736	8,259	8,858	9,778	11,751
By education level - All sectors - Bachelors degree (jobs)		4,740	4,614	5,539	5,731	6,682	8,499
By education level - All sectors - Masters or professional degree (jobs)		1,148	1,112	1,378	1,435	1,706	2,187
By education level - All sectors - Doctoral degree (jobs)		156	146	191	196	244	314
Related work experience - All sectors - None (jobs)		3,103	3,209	4,015	4,167	4,599	5,446
Related work experience - All sectors - Up to 1 year (jobs)		4,250	4,324	5,513	5,640	6,285	7,436
Related work experience - All sectors - 1 to 4 years (jobs)		7,798	7,910	9,728	10,172	11,417	13,872
Related work experience - All sectors - 4 to 10 years (jobs)		4,985	5,107	6,212	6,566	7,364	9,008
Related work experience - All sectors - Over 10 years (jobs)		1,351	1,363	1,632	1,724	1,959	2,456
On-the-Job Training - All sectors - None (jobs)		1,197	1,187	1,447	1,497	1,723	2,147
On-the-Job Training - All sectors - Up to 1 year (jobs)		14,386	14,471	18,005	18,571	20,855	25,157
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,375	4,593	5,600	5,990	6,633	8,043
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,330	1,457	1,808	1,960	2,131	2,517
On-the-Job Training - All sectors - Over 10 years (jobs)		198	203	240	250	283	354
On-Site or In-Plant Training - All sectors - None (jobs)		3,442	3,480	4,332	4,496	5,114	6,252
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		13,058	13,171	16,325	16,894	18,938	22,873
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,413	3,563	4,352	4,635	5,125	6,187
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,401	1,512	1,858	1,994	2,181	2,598
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		172	186	232	250	268	308
Wage income - All (million $2019)		1,147	1,179	1,459	1,543	1,779	2,251

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	679	622	545	451	367	315	293
Final energy use - Residential (PJ)	260	243	223	197	176	163	157
Final energy use - Commercial (PJ)	171	171	165	155	148	145	145
Final energy use - Industry (PJ)	755	838	888	904	913	905	904

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)		4.81	4.94	6.83	7.17	5.85	5.99

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	42.4	513	983	2,630	4,277	5,593	6,909
Vehicle stocks - LDV – All others (1000 units)	5,761	5,485	5,210	3,797	2,383	1,348	313
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,105	2,839	4,591	6,958	7,569	7,219
Public EV charging plugs - DC Fast (1000 units)	0.165		2.15		9.36		15.1
Public EV charging plugs - L2 (1000 units)	0.888		51.7		225		363

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.2	47.8	80.2	87.5	87.8	87.7	87.7
Sales of space heating units - Electric Resistance (%)	31.3	29.8	12.5	8.63	8.46	8.57	8.59
Sales of space heating units - Gas (%)	32.4	17.9	5.43	2.67	2.55	2.52	2.52
Sales of space heating units - Fossil (%)	4.13	4.49	1.84	1.23	1.19	1.17	1.17
Sales of water heating units - Electric Heat Pump (%)	0	9.08	48.1	56.8	57.1	57.2	57.2
Sales of water heating units - Electric Resistance (%)	68.9	73.7	46.7	40.6	40.3	40.3	40.3
Sales of water heating units - Gas Furnace (%)	27.4	14.7	2.75	0.116	0	0	0
Sales of water heating units - Other (%)	3.71	2.57	2.53	2.53	2.54	2.54	2.54
Sales of cooking units - Electric Resistance (%)	83.2	86.7	97.7	99.9	100	100	100
Sales of cooking units - Gas (%)	16.8	13.3	2.27	0.114	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.23	5.68				

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 (%)	9.56	30.6	77.3	90.8	91.9	92	92
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.92	6.26	6.57	6.58	6.55
Sales of space heating units - Gas (%)	85.6	62	17.3	2.94	1.48	1.43	1.43
Sales of space heating units - Fossil (%)	0	2.83	0.549	0.023	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.155	10.6	55.7	65.7	66.1	66.2	66.1
Sales of water heating units - Electric Resistance (%)	5.74	9.97	28	32.1	32.3	32.3	32.3
Sales of water heating units - Gas (%)	92.5	77.8	14.7	0.62	0	0	0
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56

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

Item	2020	2025	2030	2035	2040	2045	2050
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)		19,412	22,037				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,610	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,078	5,849	5,100	6,979	12,236	12,657	10,150
Installed thermal - Nuclear (MW)	4,981	4,981	4,981	4,981	4,981	6,329	10,221
Installed renewables - Rooftop PV (MW)	127	205	290	412	585	809	1,096
Installed renewables - Solar - Base land use assumptions (MW)	519	519	519	519	1,509	2,585	2,700
Installed renewables - Wind - Base land use assumptions (MW)	29	75.6	75.6	75.6	115	162	162
Installed renewables - Solar - Constrained land use assumptions (MW)	240	240	240	452	1,067	2,808	2,808
Installed renewables - Wind - Constrained land use assumptions (MW)	29	29	29	29	29	29	29
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	1.03	1.06	0.107
Capital invested - Wind - Base (billion $2018)		0.069	0	0	0.046	0	0
Capital invested - Solar PV - Constrained (billion $2018)		0	0	0.233	0.639	1.71	0
Capital invested - Wind - Constrained (billion $2018)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,029	1,029	1,029	1,029	2,901	4,915	5,134
Wind - Base land use assumptions (GWh)	106	245	245	245	361	361	361
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	501	501	501	902	2,052	5,309	5,309
Wind - Constrained land use assumptions (GWh)	106	106	106	106	106	106	106
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)							-57.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130

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 - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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 - Increase trees outside forests (1000 hectares)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209

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)							-274
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,769
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-54
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,097
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-274
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,357
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-108
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,739
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							965
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							98.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,176
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							112
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,832
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							197

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 - Total (1000 hectares)							2,141

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)		76.6	0.101	0.098	0.072	0.049	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		22.6	13.3	6.67	4.27	2.16	0.915
Premature deaths from air pollution - Mobile - On-Road (deaths)		176	178	173	156	124	85.5
Premature deaths from air pollution - Gas Stations (deaths)		19.1	19.2	18.4	16.4	13	8.96
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	15.6	13.6	11.1	8.23	5.5
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.55	1.44	1.33	1.14	0.861	0.572
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.5	3.47	3.39	3.06	2.41	1.7
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.38	3.21	3.03	2.84	2.65	2.45
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		15.2	15	14.3	12.6	10.2	7.68
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.34	2.16	1.98	1.72	1.41	1.12
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.01	0.906	0.807	0.709	0.615	0.527
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.72	0.876	0.867	0.851	0.852	0.83
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62.1	56	48.3	42	36.9	25.9
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		678	0.891	0.866	0.635	0.43	0.035
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		200	118	59.1	37.9	19.1	8.1
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,565	1,579	1,538	1,387	1,106	761
Monetary damages from air pollution - Gas Stations (million $2019)		169	170	163	145	115	79.4
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		154	139	121	98.2	73	48.7
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.8	12.8	11.8	10.1	7.63	5.07
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		31	30.8	30.1	27.2	21.4	15.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		29.9	28.4	26.8	25.1	23.4	21.7
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		134	133	127	112	90.4	68
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		20.7	19.1	17.5	15.2	12.5	9.95
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		8.93	8.02	7.14	6.27	5.44	4.66
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		15.2	7.73	7.65	7.51	7.52	7.32
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		551	497	429	373	328	230

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		453	798	1,021	1,747	1,554	1,357
By economic sector - Construction (jobs)		4,373	5,159	5,999	6,753	9,477	14,105
By economic sector - Manufacturing (jobs)		2,786	3,028	3,056	3,346	3,561	4,029
By economic sector - Mining (jobs)		2,253	1,687	1,284	990	698	405
By economic sector - Other (jobs)		299	368	487	760	1,450	2,971
By economic sector - Pipeline (jobs)		451	618	656	420	426	404
By economic sector - Professional (jobs)		2,406	2,576	3,077	5,270	6,611	8,514
By economic sector - Trade (jobs)		2,194	2,017	2,089	2,785	3,491	4,972
By economic sector - Utilities (jobs)		6,674	7,137	7,835	8,171	9,970	12,312
By resource sector - Biomass (jobs)		1,175	1,987	3,027	6,960	7,179	6,461
By resource sector - CO2 (jobs)		13.6	1,981	2,849	1,313	1,964	2,387
By resource sector - Coal (jobs)		519	20.5	17.9	15.7	14.2	12.5
By resource sector - Grid (jobs)		6,267	6,261	7,621	10,092	13,547	17,881
By resource sector - Natural Gas (jobs)		3,843	3,237	2,393	1,980	1,617	1,621
By resource sector - Nuclear (jobs)		2,514	2,474	2,435	2,397	2,359	2,323
By resource sector - Oil (jobs)		5,614	4,681	3,916	3,270	2,347	1,278
By resource sector - Solar (jobs)		1,389	1,951	2,478	3,680	7,540	16,067
By resource sector - Wind (jobs)		554	794	768	534	671	1,039
By education level - All sectors - High school diploma or less (jobs)		9,174	10,023	11,034	13,047	15,932	20,924
By education level - All sectors - Associates degree or some college (jobs)		6,563	7,064	7,734	8,913	11,293	15,319
By education level - All sectors - Bachelors degree (jobs)		4,826	4,940	5,266	6,389	7,712	9,873
By education level - All sectors - Masters or professional degree (jobs)		1,167	1,195	1,290	1,635	1,987	2,551
By education level - All sectors - Doctoral degree (jobs)		160	164	181	258	314	401
Related work experience - All sectors - None (jobs)		3,158	3,415	3,751	4,442	5,469	7,227
Related work experience - All sectors - Up to 1 year (jobs)		4,345	4,727	5,219	6,368	7,771	10,202
Related work experience - All sectors - 1 to 4 years (jobs)		7,937	8,426	9,150	10,832	13,325	17,527
Related work experience - All sectors - 4 to 10 years (jobs)		5,074	5,377	5,836	6,807	8,465	11,219

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Over 10 years (jobs)		1,376	1,442	1,549	1,793	2,207	2,893
On-the-Job Training - All sectors - None (jobs)		1,224	1,281	1,389	1,688	2,079	2,751
On-the-Job Training - All sectors - Up to 1 year (jobs)		14,664	15,615	16,999	20,480	24,883	32,345
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,449	4,787	5,227	5,941	7,510	10,146
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,349	1,485	1,654	1,867	2,434	3,376
On-the-Job Training - All sectors - Over 10 years (jobs)		204	219	236	265	332	450
On-Site or In-Plant Training - All sectors - None (jobs)		3,517	3,760	4,101	4,950	6,093	8,040
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		13,305	14,156	15,407	18,454	22,486	29,317
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,472	3,732	4,074	4,659	5,860	7,887
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,420	1,546	1,708	1,934	2,486	3,399
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		175	192	213	245	313	424
Wage income - All (million $2019)		1,165	1,245	1,366	1,632	2,019	2,659

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	680	628	570	525	490	449	400
Final energy use - Residential (PJ)	260	244	232	219	204	187	173
Final energy use - Commercial (PJ)	171	171	169	166	161	156	153
Final energy use - Industry (PJ)	755	838	889	910	921	912	909

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)		4.14	4.18	4.77	4.88	5.83	6.04

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	32.8	171	309	950	1,590	3,008	4,425
Vehicle stocks - LDV – All others (1000 units)	5,784	5,784	5,784	5,487	5,189	3,999	2,808
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	180	376	1,271	3,991	5,817
Public EV charging plugs - DC Fast (1000 units)	0.165		0.677		3.48		9.69
Public EV charging plugs - L2 (1000 units)	0.888		16.3		83.7		233

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	32.2	41.6	45.3	56	72.3	82.8	86.5
Sales of space heating units - Electric Resistance (%)	31.3	33.1	31	25.2	16.6	11.1	9.21
Sales of space heating units - Gas (%)	32.4	20.3	18.9	14.9	8.67	4.49	3.04
Sales of space heating units - Fossil (%)	4.13	5	4.74	3.81	2.44	1.57	1.28

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0	1.56	6	18.8	38.4	51.1	55.6
Sales of water heating units - Electric Resistance (%)	68.9	78.9	75.9	67	53.3	44.5	41.4
Sales of water heating units - Gas Furnace (%)	27.4	17	15.5	11.7	5.76	1.83	0.477
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.56	2.54	2.54
Sales of cooking units - Electric Resistance (%)	83.1	83.5	85.1	89.2	94.8	98.3	99.6
Sales of cooking units - Gas (%)	16.9	16.5	14.9	10.8	5.17	1.67	0.449
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.17	5.41				

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 (%)	9.56	21.7	26.9	42.4	66.6	83.3	89.7
Sales of space heating units - Electric Resistance (%)	4.81	4.61	4.65	4.78	5.23	5.91	6.33
Sales of space heating units - Gas (%)	85.6	70.4	65.3	50.5	27	10.4	3.89
Sales of space heating units - Fossil (%)	0	3.27	3.09	2.34	1.17	0.379	0.099
Sales of water heating units - Electric Heat Pump (%)	0.155	1.96	7.08	21.8	44.4	59.2	64.3
Sales of water heating units - Electric Resistance (%)	5.74	6.48	8.39	14.4	23.5	29.5	31.6
Sales of water heating units - Gas (%)	92.5	90	83	62.2	30.4	9.74	2.53
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56
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)		19,401	22,003				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,610	34.6	0	0	0	0	0
Installed thermal - Natural gas (MW)	6,106	7,000	5,301	5,301	4,778	5,399	3,803
Installed thermal - Nuclear (MW)	4,981	4,981	4,981	4,981	4,981	4,981	4,981
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	0.046	0	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	2.97	0.004	6.62	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	3,332	3,337	10,762	10,762	10,762
Biomass w/ccu allam power plant (GWh)	0	0	0	45.5	45.5	45.5	45.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	0	0	0	0	0	0
Number of facilities - Power ccu (quantity)	0	0	2	3	9	9	9

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	4	15	18	18
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	1	1	1	1	1
Conversion capital investment - Cumulative 5-yr (million $2018)		0	2,724	4,018	15,288	3,181	0
Biomass purchases (million $2018/y)		0	214	575	1,886	2,174	2,174

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	3.3	8.41	27.6	31.7	31.7
Annual - BECCS (MMT)		0	3.3	8.41	27.6	31.7	31.7
Annual - NGCC (MMT)		0	0	0	0	0	0.01
Annual - Cement and lime (MMT)		0	0	0	0	0	0
Cumulative - All (MMT)		0	3.3	11.7	39.3	71	103
Cumulative - BECCS (MMT)		0	3.3	11.7	39.3	71	103
Cumulative - NGCC (MMT)		0	0	0	0	0	0.01
Cumulative - Cement and lime (MMT)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	181	362	543	543	543
Spur (km)		0	318	1,029	2,203	1,644	2,401
All (km)		0	499	1,390	2,745	2,186	2,944
Cumulative investment - Trunk (million $2018)		0	1,293	2,585	3,878	3,878	3,878
Cumulative investment - Spur (million $2018)		0	310	1,287	2,763	2,431	2,976
Cumulative investment - All (million $2018)		0	1,603	3,872	6,641	6,309	6,854

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0.92	3.21	7.13	9.85	10
Injection wells (wells)		0	2	7	12	20	24
Resource characterization, appraisal, permitting costs (million $2020)		25.4	112	173	173	173	173
Wells and facilities construction costs (million $2020)		0	50.8	198	353	590	732

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)							-57.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277

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 - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
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)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218

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 - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209

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)							-652
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,638
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-48.9
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,339
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-652
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-3,109
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-97.8
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-3,859
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							877

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 - Permanent conservation cover (1000 hectares)							89
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							110
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							442
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,810
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							292
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							4,110
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							178
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							110
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							442
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							5,132

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)		273	187	148	127	120	119
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		21.5	23.2	25.1	29.4	24.8	23.6
Premature deaths from air pollution - Mobile - On-Road (deaths)		176	180	184	190	195	200
Premature deaths from air pollution - Gas Stations (deaths)		19.1	19.3	19.6	19.9	20.2	20.5
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.1	15.3	13.7	12.6	12.1	11.7
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		1.52	1.28	0.933	0.631	0.407	0.277
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		3.3	3.16	3.09	3.06	3.03	2.99
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		3.53	3.51	3.47	3.43	3.37	3.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		15.2	14.8	13.6	12.1	11.5	11.7
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		2.42	2.42	2.36	2.23	2.13	2.08

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.05	1.07	1.1	1.12	1.14	1.16
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		3.29	2.37	1.97	1.87	1.81	1.71
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		62.5	65.8	67.3	64.3	63.8	59.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		2,416	1,654	1,308	1,128	1,064	1,053
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		191	205	222	261	220	209
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,564	1,601	1,639	1,685	1,732	1,780
Monetary damages from air pollution - Gas Stations (million $2019)		169	171	173	177	179	182
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		152	136	121	112	107	104
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		13.5	11.3	8.27	5.6	3.6	2.45
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		29.2	28	27.3	27.1	26.9	26.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		31.3	31.1	30.8	30.4	29.9	29.2
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		135	131	120	107	101	103
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		21.5	21.5	20.9	19.8	18.8	18.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		9.33	9.51	9.71	9.89	10.1	10.3
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		29.1	20.9	17.4	16.5	16	15
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		555	585	598	571	566	530

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		450	443	442	431	431	435
By economic sector - Construction (jobs)		3,898	4,174	4,444	5,379	5,328	5,778
By economic sector - Manufacturing (jobs)		2,092	2,105	2,128	2,417	2,269	2,281
By economic sector - Mining (jobs)		2,288	1,830	1,483	1,213	1,033	878
By economic sector - Other (jobs)		172	242	286	392	417	568
By economic sector - Pipeline (jobs)		463	472	473	452	459	460
By economic sector - Professional (jobs)		2,245	2,085	2,106	2,477	2,335	2,507
By economic sector - Trade (jobs)		2,089	1,888	1,787	1,924	1,825	1,940
By economic sector - Utilities (jobs)		6,923	6,526	6,807	8,369	7,806	7,959
By resource sector - Biomass (jobs)		1,153	1,112	1,072	1,029	1,015	1,002

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - CO2 (jobs)		0	0.02	0.025	0.027	0.03	0.032
By resource sector - Coal (jobs)		544	49	42	27.3	18.5	16.1
By resource sector - Grid (jobs)		6,770	6,594	6,949	9,214	9,054	9,064
By resource sector - Natural Gas (jobs)		3,933	3,873	4,110	4,981	4,083	4,351
By resource sector - Nuclear (jobs)		2,514	2,474	2,435	2,397	2,359	2,323
By resource sector - Oil (jobs)		5,666	4,818	4,234	3,926	3,753	3,630
By resource sector - Solar (jobs)			718	963	1,192	1,413	2,255
By resource sector - Wind (jobs)		41.6	126	152	289	208	164
By education level - All sectors - High school diploma or less (jobs)		8,594	8,348	8,469	9,787	9,372	9,776
By education level - All sectors - Associates degree or some college (jobs)		6,164	5,941	6,064	7,146	6,769	7,086
By education level - All sectors - Bachelors degree (jobs)		4,593	4,292	4,251	4,796	4,515	4,651
By education level - All sectors - Masters or professional degree (jobs)		1,118	1,042	1,034	1,171	1,103	1,140
By education level - All sectors - Doctoral degree (jobs)		152	141	139	155	146	152
Related work experience - All sectors - None (jobs)		2,982	2,867	2,908	3,378	3,212	3,354
Related work experience - All sectors - Up to 1 year (jobs)		4,039	3,921	3,965	4,553	4,362	4,554
Related work experience - All sectors - 1 to 4 years (jobs)		7,508	7,161	7,214	8,323	7,895	8,210
Related work experience - All sectors - 4 to 10 years (jobs)		4,797	4,579	4,628	5,371	5,081	5,286
Related work experience - All sectors - Over 10 years (jobs)		1,295	1,235	1,243	1,430	1,354	1,401
On-the-Job Training - All sectors - None (jobs)		1,147	1,094	1,092	1,237	1,177	1,226
On-the-Job Training - All sectors - Up to 1 year (jobs)		13,803	13,184	13,252	15,198	14,444	15,001
On-the-Job Training - All sectors - 1 to 4 years (jobs)		4,202	4,051	4,132	4,857	4,605	4,811
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,284	1,253	1,297	1,554	1,478	1,559
On-the-Job Training - All sectors - Over 10 years (jobs)		185	181	183	210	200	209
On-Site or In-Plant Training - All sectors - None (jobs)		3,288	3,145	3,166	3,639	3,450	3,597
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		12,537	11,985	12,057	13,846	13,164	13,675
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		3,275	3,158	3,216	3,768	3,578	3,736
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,356	1,315	1,351	1,602	1,522	1,600
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		166	161	167	200	190	199
Wage income - All (million $2019)		1,111	1,071	1,092	1,273	1,225	1,288

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	680	628	576	545	545	562	584
Final energy use - Residential (PJ)	260	244	236	230	227	228	229
Final energy use - Commercial (PJ)	171	174	176	176	177	181	190
Final energy use - Industry (PJ)	755	847	903	938	959	961	976

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)		4.86	5	5.95	6.18	5.74	5.89

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	30.6	53.8	54.6	55.9	57.2	58.9	61.6
Sales of space heating units - Electric Resistance (%)	32	27.2	26.7	25.9	24.9	23.3	20.6
Sales of space heating units - Gas (%)	33.2	15.8	15.4	14.9	14.7	14.6	14.6
Sales of space heating units - Fossil (%)	4.21	3.29	3.32	3.27	3.22	3.18	3.2
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	68.9	80	80.1	80	79.9	79.9	79.9
Sales of water heating units - Gas Furnace (%)	27.4	17.5	17.3	17.5	17.6	17.5	17.6
Sales of water heating units - Other (%)	3.71	2.57	2.54	2.55	2.57	2.56	2.57
Sales of cooking units - Electric Resistance (%)	82.9	82.9	82.9	82.9	82.9	82.9	82.9
Sales of cooking units - Gas (%)	17.1	17.1	17.1	17.1	17.1	17.1	17.1
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		5.15	4.97				

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 (%)	9.56	27.5	56.9	76.1	79	79.4	79.4
Sales of space heating units - Electric Resistance (%)	4.81	5.67	10	15.4	18.7	19.2	19.2
Sales of space heating units - Gas (%)	85.6	63.9	31.8	8.33	2.28	1.48	1.43
Sales of space heating units - Fossil (%)	0	2.93	1.3	0.192	0.019	0	0
Sales of water heating units - Electric Heat Pump (%)	0.155	0.153	0.147	0.149	0.149	0.146	0.148
Sales of water heating units - Electric Resistance (%)	5.74	5.75	5.58	5.66	5.62	5.56	5.61
Sales of water heating units - Gas (%)	92.5	92.5	92.7	92.6	92.7	92.7	92.7
Sales of water heating units - Other (%)	1.59	1.58	1.58	1.58	1.58	1.57	1.56
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)		19,056	19,846				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	3,610	50	50	50	0	0	0
Installed thermal - Natural gas (MW)	6,030	7,010	6,898	6,110	11,103	11,365	10,382
Installed thermal - Nuclear (MW)	4,981	4,981	4,981	4,981	4,981	4,981	4,981
Installed renewables - Rooftop PV (MW)	127	205	290	412	585	809	1,096
Installed renewables - Solar - Base land use assumptions (MW)	163	163	163	163	163	163	163
Installed renewables - Wind - Base land use assumptions (MW)	29	29	29	29	29	75.6	75.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	355	355	355	355	355	355	355
Wind - Base land use assumptions (GWh)	106	106	106	106	106	245	245
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)	-8.29		-10.7				-8.71
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.86		-3.1				-3.26
Business-as-usual carbon sink - Total (Mt CO2e/y)	-10.1		-13.8				-12

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)							-57.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-363
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-2,221
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-301
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,278
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-325
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-763
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-726
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,289
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-8,323
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-86.8
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,271
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-4,002
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-441
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,556
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-626
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-1,144
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-5,156
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,556
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-19,839
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-116

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,178
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-5,783
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-591
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,834
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-928
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-1,525
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-9,586
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,364
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,823
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							9.46
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							277
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,130
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							109
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)							46.4
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							50.4
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							47.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							767
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							2,436
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							14.2
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							286
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							2,039
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							164
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0

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 - Increase trees outside forests (1000 hectares)							67.3
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							75.6
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							341
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,544
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							4,532
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							18.9
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							295
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							2,949
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							218
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)							88.2
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							101
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							272
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,267
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							5,209