



Net-Zero America - Illinois data

October 29, 2021 (updated January 9, 2022)

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		109	0.092	0.089	0.078	0.055	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		45.8	32.2	24.1	20.6	11.8	5.09
Premature deaths from air pollution - Mobile - On-Road (deaths)		551	516	394	230	108	46.5
Premature deaths from air pollution - Gas Stations (deaths)		36.3	33.4	25.3	15.1	7.48	3.68
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		167	147	107	62.7	29.7	9.97
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.45	2.9	2.23	1.6	1.08	0.75
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.78	9.44	7.72	5.34	2.95	1.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		10.8	10.3	9.78	9.21	8.63	8.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	174	136	87.7	48	21.1
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.6	35.3	28.6	21	14.2	8.82
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.24	2.65	2.07	1.52	0.998
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.83	0.616	0.592	0.562	0.551	0.534
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		120	113	103	80.4	59.8	37.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		406	285	214	182	104	45.1
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,899	4,586	3,504	2,047	963	413
Monetary damages from air pollution - Gas Stations (million \$2019)		322	296	224	134	66.2	32.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,480	1,305	950	556	263	88.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		30.6	25.7	19.7	14.2	9.59	6.65
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		86.6	83.6	68.5	47.3	26.1	11.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,697	1,543	1,204	777	425	187

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)		359	312	253	186	125	78.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	28.7	23.4	18.3	13.4	8.84
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		16.2	5.43	5.23	4.96	4.86	4.71
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,069	1,007	919	714	531	330

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,969	3,017	7,140	7,221	5,039	3,630
By economic sector - Construction (jobs)		16,261	20,969	28,695	34,874	36,511	40,490
By economic sector - Manufacturing (jobs)		9,924	10,786	14,423	14,457	12,678	13,757
By economic sector - Mining (jobs)		7,211	4,726	3,490	2,423	1,769	1,288
By economic sector - Other (jobs)		1,256	1,547	2,803	4,153	4,370	4,858
By economic sector - Pipeline (jobs)		1,058	1,601	1,066	632	556	657
By economic sector - Professional (jobs)		9,934	11,685	20,819	26,808	28,937	31,576
By economic sector - Trade (jobs)		7,700	7,844	10,633	13,160	14,285	16,174
By economic sector - Utilities (jobs)		21,231	25,005	31,303	35,463	36,679	40,731
By resource sector - Biomass (jobs)		7,011	6,904	18,564	20,699	18,517	15,984
By resource sector - CO2 (jobs)		53.1	5,823	3,018	974	1,978	3,799
By resource sector - Coal (jobs)		4,620	1,584	1,162	1,004	900	796
By resource sector - Grid (jobs)		23,104	27,441	44,009	53,899	60,462	69,628
By resource sector - Natural Gas (jobs)		10,687	8,662	7,320	7,749	4,221	3,154
By resource sector - Nuclear (jobs)		6,266	6,166	5,834	5,179	3,987	2,816
By resource sector - Oil (jobs)		11,530	9,557	7,423	5,282	3,774	2,521
By resource sector - Solar (jobs)		4,359	4,359	9,177	14,146	11,945	11,019
By resource sector - Wind (jobs)		9,915	16,682	23,865	30,258	35,041	43,445
By education level - All sectors - High school diploma or less (jobs)		33,614	37,468	52,112	59,345	58,765	63,145
By education level - All sectors - Associates degree or some college (jobs)		23,205	26,715	36,293	42,461	43,610	48,170
By education level - All sectors - Bachelors degree (jobs)		16,167	17,910	24,639	28,678	29,420	32,031
By education level - All sectors - Masters or professional degree (jobs)		3,991	4,450	6,346	7,508	7,770	8,456
By education level - All sectors - Doctoral degree (jobs)		568	637	980	1,199	1,259	1,358
Related work experience - All sectors - None (jobs)		11,247	12,719	17,613	20,299	20,403	22,132
Related work experience - All sectors - Up to 1 year (jobs)		16,285	18,064	25,458	29,027	28,719	30,805
Related work experience - All sectors - 1 to 4 years (jobs)		27,710	31,040	42,917	49,860	50,677	55,158
Related work experience - All sectors - 4 to 10 years (jobs)		17,575	20,027	27,227	31,750	32,592	35,807
Related work experience - All sectors - Over 10 years (jobs)		4,729	5,328	7,156	8,255	8,432	9,258
On-the-Job Training - All sectors - None (jobs)		4,259	4,729	6,507	7,543	7,640	8,271
On-the-Job Training - All sectors - Up to 1 year (jobs)		52,172	57,903	80,788	92,918	93,314	100,833

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)		15,592	17,985	24,251	28,304	29,061	32,064
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,811	5,745	7,747	9,192	9,570	10,639
On-the-Job Training - All sectors - Over 10 years (jobs)		711	817	1,079	1,234	1,238	1,352
On-Site or In-Plant Training - All sectors - None (jobs)		12,348	13,962	19,612	22,842	23,105	25,042
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		47,359	52,576	72,906	83,819	84,300	91,260
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		12,201	13,981	18,918	22,010	22,509	24,759
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		5,004	5,910	7,920	9,336	9,689	10,740
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		635	751	1,015	1,184	1,221	1,359
Wage income - All (million \$2019)		4,756	5,448	7,570	8,898	9,187	10,152

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		204	179	143	108	81.3	59.6
Oil consumption - Cumulative (million bbls)							4,405
Oil production - Annual (million bbls)		10.9	10.9	10.9	8.66	7.04	4.69
Natural gas consumption - Annual (tcf)		858	723	580	437	275	191
Natural gas consumption - Cumulative (tcf)							17,474
Natural gas production - Annual (tcf)		2.9	2.75	2.39	2.02	1.6	1.25

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,043	977	873	748	634	562	530
Final energy use - Residential (PJ)	591	551	512	443	367	307	269
Final energy use - Commercial (PJ)	441	434	415	383	346	319	305
Final energy use - Industry (PJ)	634	660	671	671	678	686	694

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		6.63	6.83	11.6	12.4	12.3	13

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV - EV (1000 units)	113	974	1,835	4,848	7,861	10,269	12,676
Vehicle stocks - LDV - All others (1000 units)	10,570	10,065	9,559	6,966	4,373	2,474	575
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		2,022	5,214	8,399	12,743	13,847	13,214
Public EV charging plugs - DC Fast (1000 units)	0.299		3.24		13.9		22.4
Public EV charging plugs - L2 (1000 units)	1.41		78		334		539

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 (%)	3.5	10.7	39.6	85.8	93.9	94.4	94.2
Sales of space heating units - Electric Resistance (%)	12.7	18.4	13.8	6.17	4.76	4.69	4.9
Sales of space heating units - Gas (%)	81.4	66.5	43.4	6.93	0.605	0.212	0.217
Sales of space heating units - Fossil (%)	2.45	4.48	3.17	1.07	0.718	0.695	0.671
Sales of water heating units - Electric Heat Pump (%)	0	1.85	15.9	37.3	41	41.2	41.2
Sales of water heating units - Electric Resistance (%)	22.7	38.5	43.9	56.3	58.6	58.7	58.6
Sales of water heating units - Gas Furnace (%)	77.3	59.6	40	6.28	0.367	0	0
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.111	0.111	0.112
Sales of cooking units - Electric Resistance (%)	50.8	61.3	93.4	99.7	100	100	100
Sales of cooking units - Gas (%)	49.2	38.7	6.63	0.334	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		10.8	14.4				

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 (%)	0.751	8.27	35.3	81	89	89.5	89.5
Sales of space heating units - Electric Resistance (%)	2.86	3.5	5.34	9.38	10.1	10.2	10.2
Sales of space heating units - Gas Furnace (%)	96.4	86.2	59	9.63	0.906	0.363	0.363
Sales of space heating units - Fossil (%)	0	2.07	0.402	0.017	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.271	2.48	19.4	46.1	50.7	51	51
Sales of water heating units - Electric Resistance (%)	2.65	4.62	18.3	44	48.5	48.8	48.8
Sales of water heating units - Gas Furnace (%)	96.9	92.7	62.2	9.74	0.572	0	0
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		40,927	44,680				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,459	1,811	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,505	16,076	13,082	17,242	11,062	12,500	12,526
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	11,245	10,075	6,038	6,038
Installed renewables - Rooftop PV (MW)	62.5	110	164	248	368	523	724
Installed renewables - Solar - Base land use assumptions (MW)	305	2,274	3,715	8,534	16,621	21,701	24,228
Installed renewables - Wind - Base land use assumptions (MW)	4,504	13,063	34,871	55,544	81,007	105,985	135,080
Installed renewables - Solar - Constrained land use assumptions (MW)	383	1,402	3,736	8,461	15,541	21,926	23,608
Installed renewables - Wind - Constrained land use assumptions (MW)	6,324	8,682	13,605	17,187	19,590	19,734	19,769
Capital invested - Solar PV - Base (billion \$2018)		2.64	1.73	5.31	8.41	4.98	2.34

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion \$2018)		10.1	29	25.6	30.1	28	30.8
Capital invested - Solar PV - Constrained (billion \$2018)		1.16	2.5	7.75	8.56	5.43	1.47
Capital invested - Wind - Constrained (billion \$2018)		3.55	6.59	4.41	2.68	0.201	66
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	0.024	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	0.199	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	650	4,313	6,920	15,776	30,541	39,500	43,941
Wind - Base land use assumptions (GWh)	22,788	44,881	115,313	180,643	260,635	338,249	426,461
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	770	2,660	6,920	15,546	28,427	39,685	42,633
Wind - Constrained land use assumptions (GWh)	23,175	30,574	46,053	56,813	63,779	64,186	64,286
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	224	224	224	224	224
Biomass w/ccu allam power plant (GWh)	0	0	0	24.2	24.2	24.2	24.2

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	2	2	2	2	2
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	33	56	63	63
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	1	1	1	1
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	2	2	2	2	2
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	183	29,262	19,141	5,818	0
Biomass purchases (million \$2018/y)		0	11.3	2,030	3,353	3,754	3,754

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.24	41.5	66.8	74.1	74.8
Annual - BECCS (MMT)		0	0.22	37.8	62.4	69.9	69.9
Annual - NGCC (MMT)		0	0.02	0.38	1.08	0.81	1.38
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	0.24	41.8	109	183	257
Cumulative - BECCS (MMT)		0	0.22	38	100	170	240

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - NGCC (MMT)		0	0.02	0.4	1.48	2.29	3.67
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	958	1,324	1,324	1,324	1,324
Spur (km)		0	507	1,842	3,122	4,454	5,297
All (km)		0	1,464	3,167	4,446	5,778	6,621
Cumulative investment - Trunk (million \$2018)		0	5,900	8,150	8,150	8,150	8,150
Cumulative investment - Spur (million \$2018)		0	304	1,825	2,792	4,354	5,015
Cumulative investment - All (million \$2018)		0	6,204	9,975	10,943	12,504	13,165

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	1.1	3.52	7.23	11.2	14.9
Injection wells (wells)		0	2	9	15	26	32
Resource characterization, appraisal, permitting costs (million \$2020)		100	281	361	361	361	361
Wells and facilities construction costs (million \$2020)		0	66.8	260	464	776	963

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)							-47.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-44.9
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-93.2
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-55.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-45.5
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,217
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,715
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-366
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-418
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,654
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-71.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,570
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,679
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-80.8
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-90.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,347
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,073
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,599
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-828
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-14,157
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-95.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,692
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,426
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-108
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,477
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,430
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,831
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-21,662
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,239
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.82
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							342
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							474
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							20
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)							174
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							248
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,469
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							353
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							855
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							30
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)							252
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							269
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							172
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							500
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,444
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							364
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,237
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							39.9
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)							330
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							359
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							137
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							411
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,894

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)							-3,836

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-9,245
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-13,295
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-3,836
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-17,544
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-428
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-21,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,734
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,799
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							389
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,922
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,734
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,209
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							779
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,721

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)		109	0.092	0.089	0.078	0.055	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		49.7	33.9	14.4	6.27	2.09	1.52
Premature deaths from air pollution - Mobile - On-Road (deaths)		561	569	558	506	405	281
Premature deaths from air pollution - Gas Stations (deaths)		37.1	37.6	36.4	32.7	26.1	18.2
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		168	156	142	123	95	63.3
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.54	3.3	3.08	2.76	2.31	1.85

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.84	10.2	10.3	9.82	8.12	5.98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		10.8	10.3	9.78	9.21	8.63	8.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	186	177	160	132	98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.7	39.5	37.8	33.6	27.5	21.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.47	3.11	2.74	2.38	2.03
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.76	0.619	0.603	0.581	0.553	0.499
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		120	110	95.9	84.4	74.8	52
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		440	300	127	55.5	18.5	13.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,985	5,062	4,958	4,497	3,605	2,497
Monetary damages from air pollution - Gas Stations (million \$2019)		329	333	322	290	231	161
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,485	1,381	1,258	1,086	842	561
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		31.4	29.2	27.3	24.5	20.4	16.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		87.2	90.1	91.7	87	71.9	53
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,700	1,645	1,569	1,417	1,173	868
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		361	350	335	298	244	190
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	30.7	27.5	24.2	21	18
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		15.5	5.46	5.32	5.12	4.88	4.4
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,067	972	852	749	664	461

Table 18: E- scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,976	3,048	10,821	11,837	6,984	3,629
By economic sector - Construction (jobs)		16,329	22,888	29,584	37,804	41,723	46,599
By economic sector - Manufacturing (jobs)		10,065	11,106	15,737	18,648	17,034	16,748
By economic sector - Mining (jobs)		7,181	4,843	3,863	3,062	2,486	1,788
By economic sector - Other (jobs)		1,277	1,594	2,714	4,185	4,817	5,420
By economic sector - Pipeline (jobs)		1,062	2,076	1,313	769	842	1,070
By economic sector - Professional (jobs)		9,983	11,999	25,796	37,824	36,225	35,993
By economic sector - Trade (jobs)		7,732	8,068	12,200	17,081	17,409	18,746
By economic sector - Utilities (jobs)		20,987	26,949	31,804	38,204	41,533	46,442
By resource sector - Biomass (jobs)		7,022	6,981	32,817	46,911	29,740	15,456
By resource sector - CO2 (jobs)		53.7	9,941	5,184	1,706	3,392	6,468
By resource sector - Coal (jobs)		4,521	1,588	1,173	1,020	901	770
By resource sector - Grid (jobs)		22,549	27,684	43,392	58,849	68,465	76,996
By resource sector - Natural Gas (jobs)		10,685	8,230	6,255	6,791	3,770	3,472
By resource sector - Nuclear (jobs)		6,266	6,166	5,834	5,179	4,576	3,648
By resource sector - Oil (jobs)		11,626	10,042	8,700	7,294	5,907	3,953
By resource sector - Solar (jobs)		4,615	4,581	7,650	12,236	12,770	11,114
By resource sector - Wind (jobs)		10,256	17,359	22,830	29,426	39,533	54,560
By education level - All sectors - High school diploma or less (jobs)		33,623	39,818	58,536	72,433	70,630	72,460
By education level - All sectors - Associates degree or some college (jobs)		23,210	28,552	39,191	49,813	51,604	55,633
By education level - All sectors - Bachelors degree (jobs)		16,194	18,874	27,709	35,989	35,796	37,040
By education level - All sectors - Masters or professional degree (jobs)		3,996	4,668	7,228	9,555	9,461	9,742
By education level - All sectors - Doctoral degree (jobs)		570	661	1,170	1,623	1,564	1,561
Related work experience - All sectors - None (jobs)		11,251	13,541	19,699	24,762	24,486	25,439
Related work experience - All sectors - Up to 1 year (jobs)		16,303	19,082	28,907	36,248	34,852	35,300
Related work experience - All sectors - 1 to 4 years (jobs)		27,720	32,963	47,650	60,479	60,721	63,588
Related work experience - All sectors - 4 to 10 years (jobs)		17,586	21,336	29,790	38,030	38,890	41,384
Related work experience - All sectors - Over 10 years (jobs)		4,734	5,651	7,789	9,894	10,105	10,725
On-the-Job Training - All sectors - None (jobs)		4,268	4,993	7,319	9,421	9,275	9,524
On-the-Job Training - All sectors - Up to 1 year (jobs)		52,212	61,245	91,068	115,245	112,936	116,011
On-the-Job Training - All sectors - 1 to 4 years (jobs)		15,591	19,255	26,055	32,853	34,236	37,058
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,807	6,208	8,231	10,447	11,128	12,268
On-the-Job Training - All sectors - Over 10 years (jobs)		714	871	1,160	1,447	1,479	1,575
On-Site or In-Plant Training - All sectors - None (jobs)		12,371	14,805	22,017	28,106	27,840	28,867
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		47,386	55,646	81,809	103,427	101,829	105,015
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		12,201	14,944	20,441	25,739	26,601	28,591
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		5,001	6,370	8,475	10,754	11,341	12,396
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		634	807	1,092	1,388	1,443	1,567
Wage income - All (million \$2019)		4,756	5,796	8,365	10,741	10,980	11,698

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,044	984	908	847	798	740	672
Final energy use - Residential (PJ)	591	552	524	495	458	408	352
Final energy use - Commercial (PJ)	441	434	424	414	399	379	356
Final energy use - Industry (PJ)	634	660	674	680	693	701	708

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		5.41	5.46	7.27	7.54	10.4	11

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	87.8	341	593	1,764	2,935	5,527	8,119
Vehicle stocks - LDV – All others (1000 units)	10,613	10,613	10,613	10,067	9,521	7,337	5,153
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	333	687	2,331	7,297	10,644
Public EV charging plugs - DC Fast (1000 units)	0.299		1.05		5.19		14.3
Public EV charging plugs - L2 (1000 units)	1.41		25.2		125		345

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 (%)	3.5	8.23	11.6	22.2	45.5	72.3	87.2
Sales of space heating units - Electric Resistance (%)	12.7	18.7	18.1	16.4	12.5	8.16	5.9
Sales of space heating units - Gas (%)	81.4	68.5	65.9	57.4	39	17.8	5.87
Sales of space heating units - Fossil (%)	2.45	4.6	4.47	3.97	2.93	1.72	1.01
Sales of water heating units - Electric Heat Pump (%)	0	0.582	2.2	7.34	18.4	30.9	37.9
Sales of water heating units - Electric Resistance (%)	22.7	38.3	38.8	40.9	46.2	52.8	56.7
Sales of water heating units - Gas Furnace (%)	77.3	61	58.9	51.7	35.3	16.1	5.22
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.113	0.113	0.112
Sales of cooking units - Electric Resistance (%)	50.6	51.9	56.4	68.3	84.9	95.1	98.7
Sales of cooking units - Gas (%)	49.4	48.1	43.6	31.7	15.1	4.87	1.31
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		10.7	14.3				

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 (%)	0.751	6.2	9.31	19.3	41.6	67.6	82.4
Sales of space heating units - Electric Resistance (%)	2.86	3.43	3.64	4.33	6.04	8.25	9.53
Sales of space heating units - Gas Furnace (%)	96.4	88	84.8	74.6	51.5	23.8	7.97
Sales of space heating units - Fossil (%)	0	2.4	2.27	1.73	0.88	0.287	0.075
Sales of water heating units - Electric Heat Pump (%)	0.271	1.04	2.99	9.2	22.7	38.2	46.9
Sales of water heating units - Electric Resistance (%)	2.65	3.78	5.32	10.5	22.3	36.6	44.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	96.9	95	91.5	80.1	54.8	25	8.1
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		40,922	44,666				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,459	1,811	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,510	16,585	14,596	13,599	5,077	4,473	9,064
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	11,245	10,075	9,066	6,038

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)							-479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-449
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-932
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-55.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-455
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,217
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,715
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-366
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-418
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,654
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-71.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,570
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,679
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-80.8
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,347
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,073
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,599
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-828
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-14,157

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-95.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,692
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,426
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-108
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,477
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,430
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,831
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-21,662
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,239
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.82
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							342
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							474
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							20
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)							174
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							248
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,469
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							353
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							855
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							30

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							252
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							269
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							172
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							500
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,444
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							364
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,237
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							39.9
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)							330
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							359
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							137
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							411
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,894

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)							-3,836
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-9,245
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-13,295

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-3,836
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-17,544
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-428
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-21,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,734
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,799
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							389
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,922
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,734
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,209
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							779
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,721

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)		109	0.092	0.089	0.078	0.055	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		48.7	32.3	18.6	12.5	4.43	1.22
Premature deaths from air pollution - Mobile - On-Road (deaths)		551	516	394	230	108	46.5
Premature deaths from air pollution - Gas Stations (deaths)		36.3	33.4	25.3	15.1	7.48	3.68
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		167	147	107	62.7	29.7	9.97
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.45	2.9	2.23	1.6	1.08	0.75
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.78	9.44	7.72	5.34	2.95	1.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		10.8	10.3	9.78	9.21	8.63	8.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	174	136	87.7	48	21.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.6	35.3	28.6	21	14.2	8.82
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.24	2.65	2.07	1.52	0.998
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.03	0.616	0.591	0.56	0.549	0.455
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		119	112	97.2	69.9	43.1	6.64
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		432	286	165	110	39.2	10.8
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,899	4,586	3,504	2,047	963	413
Monetary damages from air pollution - Gas Stations (million \$2019)		322	296	224	134	66.2	32.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,480	1,305	950	556	263	88.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		30.6	25.7	19.7	14.2	9.59	6.65
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		86.6	83.6	68.5	47.3	26.1	11.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,697	1,543	1,204	777	425	187
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		359	312	253	186	125	78.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	28.7	23.4	18.3	13.4	8.84
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		17.9	5.44	5.22	4.94	4.85	4.01
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,053	993	863	620	382	59

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,969	3,005	6,775	6,771	4,328	3,644
By economic sector - Construction (jobs)		15,962	22,760	34,900	42,737	51,980	65,285
By economic sector - Manufacturing (jobs)		10,372	12,105	17,188	18,665	20,459	22,910
By economic sector - Mining (jobs)		7,293	4,574	3,188	2,025	1,240	456
By economic sector - Other (jobs)		1,183	2,305	4,090	5,178	6,980	9,396
By economic sector - Pipeline (jobs)		1,031	868	623	415	248	88.6
By economic sector - Professional (jobs)		9,987	13,463	24,225	32,536	39,405	50,837

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		7,712	8,893	12,681	16,147	20,345	27,107
By economic sector - Utilities (jobs)		21,148	23,944	33,357	40,447	46,614	57,825
By resource sector - Biomass (jobs)		6,999	6,873	16,910	20,680	16,202	16,514
By resource sector - CO2 (jobs)		0	0.001	0.001	0.001	0.002	0.001
By resource sector - Coal (jobs)		4,879	1,585	1,160	1,002	899	739
By resource sector - Grid (jobs)		23,000	30,866	52,008	66,770	83,053	105,721
By resource sector - Natural Gas (jobs)		10,466	8,288	6,199	6,434	3,463	4,728
By resource sector - Nuclear (jobs)		6,266	6,166	5,258	3,800	2,710	986
By resource sector - Oil (jobs)		11,532	9,477	7,198	4,768	2,838	181
By resource sector - Solar (jobs)		3,730	10,030	16,923	17,721	23,669	27,014
By resource sector - Wind (jobs)		10,785	18,631	31,370	43,746	58,765	81,664
By education level - All sectors - High school diploma or less (jobs)		33,662	39,435	59,009	69,653	79,228	96,957
By education level - All sectors - Associates degree or some college (jobs)		23,224	28,054	41,781	50,930	60,349	75,656
By education level - All sectors - Bachelors degree (jobs)		16,207	18,973	27,924	34,017	39,859	49,647
By education level - All sectors - Masters or professional degree (jobs)		3,996	4,750	7,191	8,894	10,470	13,149
By education level - All sectors - Doctoral degree (jobs)		569	703	1,121	1,427	1,692	2,140
Related work experience - All sectors - None (jobs)		11,247	13,329	19,953	23,928	27,602	34,186
Related work experience - All sectors - Up to 1 year (jobs)		16,322	19,236	28,908	34,150	38,816	47,608
Related work experience - All sectors - 1 to 4 years (jobs)		27,758	32,707	48,849	59,073	68,899	85,516
Related work experience - All sectors - 4 to 10 years (jobs)		17,589	21,029	31,135	37,906	44,687	55,831
Related work experience - All sectors - Over 10 years (jobs)		4,742	5,614	8,181	9,865	11,594	14,408
On-the-Job Training - All sectors - None (jobs)		4,260	5,056	7,438	8,931	10,395	12,891
On-the-Job Training - All sectors - Up to 1 year (jobs)		52,314	61,241	91,548	109,623	126,217	155,708
On-the-Job Training - All sectors - 1 to 4 years (jobs)		15,589	18,793	27,849	33,857	40,056	50,115
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,784	5,956	8,938	11,025	13,194	16,694
On-the-Job Training - All sectors - Over 10 years (jobs)		712	869	1,254	1,485	1,738	2,140
On-Site or In-Plant Training - All sectors - None (jobs)		12,364	14,832	22,396	27,090	31,512	39,081
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		47,479	55,543	82,676	98,966	114,147	140,943
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		12,203	14,641	21,698	26,276	30,956	38,625
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,979	6,121	9,093	11,165	13,297	16,772
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		634	780	1,164	1,424	1,686	2,128
Wage income - All (million \$2019)		4,757	5,709	8,594	10,528	12,436	15,664

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,043	977	873	748	634	562	530
Final energy use - Residential (PJ)	591	551	512	443	367	307	269
Final energy use - Commercial (PJ)	441	434	415	383	346	319	305
Final energy use - Industry (PJ)	634	660	671	671	678	686	694

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		6.63	6.83	11.6	12.4	12.3	13

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV - EV (1000 units)	113	974	1,835	4,848	7,861	10,269	12,676
Vehicle stocks - LDV - All others (1000 units)	10,570	10,065	9,559	6,966	4,373	2,474	575
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		2,022	5,214	8,399	12,743	13,847	13,214
Public EV charging plugs - DC Fast (1000 units)	0.299		3.24		13.9		22.4
Public EV charging plugs - L2 (1000 units)	1.41		78		334		539

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 (%)	3.5	10.7	39.6	85.8	93.9	94.4	94.2
Sales of space heating units - Electric Resistance (%)	12.7	18.4	13.8	6.17	4.76	4.69	4.9
Sales of space heating units - Gas (%)	81.4	66.5	43.4	6.93	0.605	0.212	0.217
Sales of space heating units - Fossil (%)	2.45	4.48	3.17	1.07	0.718	0.695	0.671
Sales of water heating units - Electric Heat Pump (%)	0	1.85	15.9	37.3	41	41.2	41.2
Sales of water heating units - Electric Resistance (%)	22.7	38.5	43.9	56.3	58.6	58.7	58.6
Sales of water heating units - Gas Furnace (%)	77.3	59.6	40	6.28	0.367	0	0
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.111	0.111	0.112
Sales of cooking units - Electric Resistance (%)	50.8	61.3	93.4	99.7	100	100	100
Sales of cooking units - Gas (%)	49.2	38.7	6.63	0.334	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		10.8	14.4				

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 (%)	0.751	8.27	35.3	81	89	89.5	89.5
Sales of space heating units - Electric Resistance (%)	2.86	3.5	5.34	9.38	10.1	10.2	10.2
Sales of space heating units - Gas Furnace (%)	96.4	86.2	59	9.63	0.906	0.363	0.363
Sales of space heating units - Fossil (%)	0	2.07	0.402	0.017	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.271	2.48	19.4	46.1	50.7	51	51
Sales of water heating units - Electric Resistance (%)	2.65	4.62	18.3	44	48.5	48.8	48.8
Sales of water heating units - Gas Furnace (%)	96.9	92.7	62.2	9.74	0.572	0	0
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		40,927	44,680				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,459	1,811	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,510	16,492	14,814	15,571	9,527	12,323	26,153
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	8,378	7,208	3,588	0
Installed renewables - Rooftop PV (MW)	62.5	110	164	248	368	523	724
Installed renewables - Solar - Base land use assumptions (MW)	305	1,746	6,941	16,607	24,091	33,662	48,380
Installed renewables - Wind - Base land use assumptions (MW)	6,208	13,339	35,822	67,091	103,262	137,735	155,340
Installed renewables - Solar - Constrained land use assumptions (MW)	305	2,430	6,929	16,469	23,661	33,449	49,936
Installed renewables - Wind - Constrained land use assumptions (MW)	6,967	9,325	14,280	20,182	20,377	20,412	141,500
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		1.93	6.22	10.7	7.78	9.39	13.6
Capital invested - Wind - Base (billion \$2018)		10.5	29.9	38.8	42.7	38.7	18.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	650	3,335	12,940	30,355	44,122	61,587	88,304
Wind - Base land use assumptions (GWh)	22,788	45,757	118,224	217,032	329,845	434,349	485,306
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	1,300	9,037	25,367	59,858	85,959	121,832	181,695
Wind - Constrained land use assumptions (GWh)	46,350	61,148	92,321	127,299	128,372	128,572	889,474
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO ₂ e/y)							-47.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO ₂ e/y)							-44.9
Carbon sink potential - Low - Extend rotation length (1000 tCO ₂ e/y)							-93.2
Carbon sink potential - Low - Improve plantations (1000 tCO ₂ e/y)							-55.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO ₂ e/y)							-45.5
Carbon sink potential - Low - Increase trees outside forests (1000 tCO ₂ e/y)							-1,217
Carbon sink potential - Low - Reforest cropland (1000 tCO ₂ e/y)							-2,715
Carbon sink potential - Low - Reforest pasture (1000 tCO ₂ e/y)							-366
Carbon sink potential - Low - Restore productivity (1000 tCO ₂ e/y)							-418
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-6,654

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-71.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-1,570
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-1,679
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-80.8
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-909
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-2,347
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-4,073
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-2,599
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-828
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-14,157
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-95.6
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-2,692
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-2,426
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-108
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-1,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-3,477
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-5,430
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-4,831
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-21,662
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-1,239
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.82
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							342
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							474
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							20
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)							174
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							180

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							248
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,469
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							353
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							855
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							30
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)							252
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							269
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							172
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							500
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,444
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							364
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,237
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							39.9
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)							330
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							359
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							137
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							411

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,894

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)							-3,836
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-9,245
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-214
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-13,295
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-3,836
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-17,544
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-428
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-21,808
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,734
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,799
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							389
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,922
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,734
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,209
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							779
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,721

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)		109	0.092	0.089	0.078	0.055	0.004

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		41.6	22.4	35.8	25.6	10.3	3.32
Premature deaths from air pollution - Mobile - On-Road (deaths)		551	516	394	230	108	46.5
Premature deaths from air pollution - Gas Stations (deaths)		36.3	33.4	25.3	15.1	7.48	3.68
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		167	147	107	62.7	29.7	9.97
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.45	2.9	2.23	1.6	1.08	0.75
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.78	9.44	7.72	5.34	2.95	1.34
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		10.8	10.3	9.78	9.21	8.63	8.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	174	136	87.7	48	21.1
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.6	35.3	28.6	21	14.2	8.82
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.24	2.65	2.07	1.52	0.998
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.64	0.614	0.592	0.561	0.551	0.455
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		122	118	115	96.4	80	59.1
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		369	199	317	227	91	29.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,899	4,586	3,504	2,047	963	413
Monetary damages from air pollution - Gas Stations (million \$2019)		322	296	224	134	66.2	32.6
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,480	1,305	950	556	263	88.3
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		30.6	25.7	19.7	14.2	9.59	6.65
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		86.6	83.6	68.5	47.3	26.1	11.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,697	1,543	1,204	777	425	187
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		359	312	253	186	125	78.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	28.7	23.4	18.3	13.4	8.84
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		14.4	5.42	5.22	4.95	4.86	4.01
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,081	1,045	1,021	856	711	525

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,974	3,055	10,940	9,798	5,649	3,619
By economic sector - Construction (jobs)		15,081	22,454	25,851	26,545	26,116	26,648
By economic sector - Manufacturing (jobs)		9,075	8,320	12,161	12,469	9,954	8,300
By economic sector - Mining (jobs)		7,101	4,902	3,829	2,804	2,217	1,709
By economic sector - Other (jobs)		1,116	1,831	2,269	2,657	2,583	2,531
By economic sector - Pipeline (jobs)		1,086	2,305	1,525	908	960	1,255
By economic sector - Professional (jobs)		9,258	10,528	22,506	25,542	22,499	19,959
By economic sector - Trade (jobs)		7,336	7,519	10,396	11,315	10,267	9,560
By economic sector - Utilities (jobs)		20,014	25,463	30,549	31,348	34,498	35,604
By resource sector - Biomass (jobs)		7,002	6,986	34,088	34,474	22,198	15,521
By resource sector - CO2 (jobs)		54.3	11,258	5,883	1,907	3,805	7,295
By resource sector - Coal (jobs)		4,365	1,796	1,474	1,301	1,184	847
By resource sector - Grid (jobs)		20,889	22,422	39,358	44,834	45,218	45,700
By resource sector - Natural Gas (jobs)		10,575	9,744	8,395	9,096	6,988	5,590
By resource sector - Nuclear (jobs)		6,266	6,166	5,834	5,179	9,491	9,553
By resource sector - Oil (jobs)		11,528	9,557	7,422	5,282	3,884	2,883
By resource sector - Solar (jobs)		3,609	8,033	6,781	7,235	5,990	4,956
By resource sector - Wind (jobs)		8,752	10,415	10,791	14,078	15,985	16,840
By education level - All sectors - High school diploma or less (jobs)		31,693	37,454	53,083	53,463	48,188	45,425
By education level - All sectors - Associates degree or some college (jobs)		21,745	26,645	34,832	36,146	34,647	33,746
By education level - All sectors - Bachelors degree (jobs)		15,289	17,380	24,636	25,823	24,436	23,043
By education level - All sectors - Masters or professional degree (jobs)		3,775	4,293	6,442	6,830	6,439	6,034
By education level - All sectors - Doctoral degree (jobs)		537	604	1,033	1,125	1,034	939
Related work experience - All sectors - None (jobs)		10,603	12,724	17,825	18,182	16,673	15,844
Related work experience - All sectors - Up to 1 year (jobs)		15,365	17,862	26,111	26,460	23,586	21,966
Related work experience - All sectors - 1 to 4 years (jobs)		26,093	30,712	42,679	44,051	41,295	39,353
Related work experience - All sectors - 4 to 10 years (jobs)		16,528	19,866	26,516	27,537	26,306	25,392
Related work experience - All sectors - Over 10 years (jobs)		4,450	5,213	6,895	7,157	6,883	6,631
On-the-Job Training - All sectors - None (jobs)		4,026	4,677	6,548	6,769	6,286	5,921
On-the-Job Training - All sectors - Up to 1 year (jobs)		49,211	56,923	81,874	83,988	76,842	72,189
On-the-Job Training - All sectors - 1 to 4 years (jobs)		14,628	18,041	23,211	23,965	23,168	22,684
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,506	5,923	7,381	7,632	7,459	7,437

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		668	813	1,012	1,033	989	956
On-Site or In-Plant Training - All sectors - None (jobs)		11,627	13,774	19,654	20,307	18,822	17,771
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		44,666	51,788	73,548	75,426	69,317	65,365
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		11,454	13,995	18,239	18,788	18,003	17,535
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,698	6,063	7,607	7,854	7,641	7,572
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		595	757	978	1,011	960	943
Wage income - All (million \$2019)		4,482	5,425	7,521	7,853	7,509	7,303

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,043	977	873	748	634	562	530
Final energy use - Residential (PJ)	591	551	512	443	367	307	269
Final energy use - Commercial (PJ)	441	434	415	383	346	319	305
Final energy use - Industry (PJ)	634	660	671	671	678	686	694

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		6.63	6.83	11.6	12.4	12.3	13

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	113	974	1,835	4,848	7,861	10,269	12,676
Vehicle stocks - LDV – All others (1000 units)	10,570	10,065	9,559	6,966	4,373	2,474	575
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		2,022	5,214	8,399	12,743	13,847	13,214
Public EV charging plugs - DC Fast (1000 units)	0.299		3.24		13.9		22.4
Public EV charging plugs - L2 (1000 units)	1.41		78		334		539

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 (%)	3.5	10.7	39.6	85.8	93.9	94.4	94.2
Sales of space heating units - Electric Resistance (%)	12.7	18.4	13.8	6.17	4.76	4.69	4.9
Sales of space heating units - Gas (%)	81.4	66.5	43.4	6.93	0.605	0.212	0.217
Sales of space heating units - Fossil (%)	2.45	4.48	3.17	1.07	0.718	0.695	0.671
Sales of water heating units - Electric Heat Pump (%)	0	1.85	15.9	37.3	41	41.2	41.2
Sales of water heating units - Electric Resistance (%)	22.7	38.5	43.9	56.3	58.6	58.7	58.6
Sales of water heating units - Gas Furnace (%)	77.3	59.6	40	6.28	0.367	0	0
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.111	0.111	0.112
Sales of cooking units - Electric Resistance (%)	50.8	61.3	93.4	99.7	100	100	100
Sales of cooking units - Gas (%)	49.2	38.7	6.63	0.334	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		10.8	14.4				

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 (%)	0.751	8.27	35.3	81	89	89.5	89.5
Sales of space heating units - Electric Resistance (%)	2.86	3.5	5.34	9.38	10.1	10.2	10.2
Sales of space heating units - Gas Furnace (%)	96.4	86.2	59	9.63	0.906	0.363	0.363
Sales of space heating units - Fossil (%)	0	2.07	0.402	0.017	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.271	2.48	19.4	46.1	50.7	51	51
Sales of water heating units - Electric Resistance (%)	2.65	4.62	18.3	44	48.5	48.8	48.8
Sales of water heating units - Gas Furnace (%)	96.9	92.7	62.2	9.74	0.572	0	0
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric Resistance (%)	41	54.2	82.9	88.6	88.9	88.9	88.9
Sales of cooking units - Gas (%)	59	45.8	17.1	11.4	11.1	11.1	11.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		40,927	44,680				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,459	1,811	883	883	883	883	0
Installed thermal - Natural gas (MW)	16,535	13,854	8,655	14,004	12,075	15,427	15,033
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	11,245	10,075	11,078	10,236
Installed renewables - Rooftop PV (MW)	62.5	110	164	248	368	523	724
Installed renewables - Solar - Base land use assumptions (MW)	305	2,361	8,116	11,459	15,437	17,336	17,336
Installed renewables - Wind - Base land use assumptions (MW)	6,208	11,406	18,840	18,840	25,146	36,016	58,717
Installed renewables - Solar - Constrained land use assumptions (MW)	305	2,170	6,603	10,420	14,526	15,692	15,692
Installed renewables - Wind - Constrained land use assumptions (MW)	6,208	8,399	11,028	11,060	12,661	14,688	19,009
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion \$2018)		2.75	6.89	3.69	4.13	1.86	0
Capital invested - Wind - Base (billion \$2018)		7.65	9.8	0	7.4	12.2	24
Capital invested - Solar PV - Constrained (billion \$2018)		2.5	5.3	4.21	4.26	1.14	0
Capital invested - Wind - Constrained (billion \$2018)		3.22	3.5	0.04	1.89	2.27	4.57

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	650	4,484	15,207	21,416	28,778	32,247	32,247
Wind - Base land use assumptions (GWh)	22,788	39,611	63,820	63,820	83,778	118,245	190,130
Offshore Wind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Constrained land use assumptions (GWh)	650	4,120	12,364	19,414	27,032	29,170	29,170
Wind - Constrained land use assumptions (GWh)	22,788	29,699	38,214	38,321	43,298	49,489	62,135
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)							-479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-449
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-932
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-55.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-455
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,217
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,715
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-366
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-418
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,654
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-71.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,570
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,679
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-80.8
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-909
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,347
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,073
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,599
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-828
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-14,157
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-95.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,692
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,426
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-108
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-1,364

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-3,477
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-5,430
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-4,831
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-21,662
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-1,239
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.82
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							342
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							474
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							20
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)							174
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							248
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,469
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							353
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							855
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							30
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)							252
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							269
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							172

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							500
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,444
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							364
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,237
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							39.9
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)							330
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							359
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							137
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							411
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,894

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-3,836
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO ₂ e/y)							-9,245
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-214
Carbon sink potential - Moderate deployment - Total (1000 tCO ₂ e/y)							-13,295
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO ₂ e/y)							-3,836
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO ₂ e/y)							-17,544
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO ₂ e/y)							-428
Carbon sink potential - Aggressive deployment - Total (1000 tCO ₂ e/y)							-21,808

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							1,734
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,799
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							389
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							5,922
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							1,734
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							7,209
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							779
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,721

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)		109	0.092	0.089	0.078	0.055	0.004
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		52	30.4	18.4	11.8	5.93	1.97
Premature deaths from air pollution - Mobile - On-Road (deaths)		561	569	558	506	405	281
Premature deaths from air pollution - Gas Stations (deaths)		37.1	37.6	36.4	32.7	26.1	18.2
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		168	156	142	123	95	63.3
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.54	3.3	3.08	2.76	2.31	1.85
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.84	10.2	10.3	9.82	8.12	5.98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		10.8	10.3	9.78	9.21	8.63	8.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		192	186	177	160	132	98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		40.7	39.5	37.8	33.6	27.5	21.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		3.85	3.47	3.11	2.74	2.38	2.03
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.82	0.618	0.603	0.582	0.57	0.544

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		120	110	95.9	84.4	74.8	52
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		962	0.816	0.793	0.689	0.484	0.033
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		461	269	163	105	52.6	17.4
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,985	5,062	4,958	4,497	3,605	2,497
Monetary damages from air pollution - Gas Stations (million \$2019)		329	333	322	290	231	161
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,485	1,381	1,258	1,086	842	561
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		31.4	29.2	27.3	24.5	20.4	16.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		87.2	90.1	91.7	87	71.9	53
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		95.6	91.3	86.5	81.5	76.4	71.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,700	1,645	1,569	1,417	1,173	868
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		361	350	335	298	244	190
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		34.1	30.7	27.5	24.2	21	18
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		16.1	5.46	5.32	5.13	5.03	4.8
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,067	972	852	749	664	461

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,973	3,193	9,993	10,944	8,081	6,996
By economic sector - Construction (jobs)		16,366	23,208	28,284	31,591	34,640	40,693
By economic sector - Manufacturing (jobs)		10,144	11,248	14,638	15,456	15,172	16,970
By economic sector - Mining (jobs)		7,218	4,836	3,880	3,151	2,520	1,731
By economic sector - Other (jobs)		1,279	1,611	2,531	3,350	3,761	4,516
By economic sector - Pipeline (jobs)		1,052	2,106	1,338	789	840	1,068
By economic sector - Professional (jobs)		10,051	12,314	24,268	33,167	34,342	36,922
By economic sector - Trade (jobs)		7,770	8,162	11,736	15,044	15,654	17,259
By economic sector - Utilities (jobs)		21,018	27,213	30,794	33,452	35,767	41,603
By resource sector - Biomass (jobs)		7,016	7,370	30,532	43,076	37,302	33,470
By resource sector - CO2 (jobs)		53.6	10,191	5,319	1,790	3,512	6,568
By resource sector - Coal (jobs)		4,608	1,587	1,173	1,021	915	804
By resource sector - Grid (jobs)		22,588	28,018	41,265	49,367	57,646	69,001
By resource sector - Natural Gas (jobs)		10,648	8,131	6,366	7,334	3,832	2,787
By resource sector - Nuclear (jobs)		6,266	6,166	5,834	5,179	4,183	3,093
By resource sector - Oil (jobs)		11,626	10,042	8,700	7,507	5,939	3,790

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		4,547	4,522	6,669	8,922	8,875	9,870
By resource sector - Wind (jobs)		10,517	17,862	21,604	22,747	28,572	38,374
By education level - All sectors - High school diploma or less (jobs)		33,740	40,394	55,682	62,915	63,289	69,922
By education level - All sectors - Associates degree or some college (jobs)		23,295	28,939	37,383	42,821	45,030	51,268
By education level - All sectors - Bachelors degree (jobs)		16,252	19,143	26,410	31,420	32,375	35,564
By education level - All sectors - Masters or professional degree (jobs)		4,010	4,741	6,878	8,361	8,620	9,436
By education level - All sectors - Doctoral degree (jobs)		573	673	1,109	1,428	1,463	1,568
Related work experience - All sectors - None (jobs)		11,287	13,735	18,762	21,518	21,905	24,341
Related work experience - All sectors - Up to 1 year (jobs)		16,363	19,365	27,475	31,554	31,584	34,633
Related work experience - All sectors - 1 to 4 years (jobs)		27,822	33,435	45,372	52,446	54,034	60,147
Related work experience - All sectors - 4 to 10 years (jobs)		17,648	21,630	28,420	32,876	34,332	38,616
Related work experience - All sectors - Over 10 years (jobs)		4,751	5,725	7,433	8,550	8,922	10,020
On-the-Job Training - All sectors - None (jobs)		4,283	5,063	6,978	8,206	8,374	9,192
On-the-Job Training - All sectors - Up to 1 year (jobs)		52,404	62,138	86,629	100,313	101,808	112,143
On-the-Job Training - All sectors - 1 to 4 years (jobs)		15,645	19,514	24,873	28,233	29,740	33,914
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,821	6,292	7,876	8,952	9,568	11,056
On-the-Job Training - All sectors - Over 10 years (jobs)		717	883	1,106	1,239	1,287	1,452
On-Site or In-Plant Training - All sectors - None (jobs)		12,415	15,028	20,929	24,371	24,921	27,586
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		47,560	56,443	77,873	89,975	91,562	101,109
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		12,243	15,146	19,504	22,152	23,206	26,344
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		5,016	6,455	8,113	9,251	9,827	11,272
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		636	818	1,044	1,194	1,261	1,448
Wage income - All (million \$2019)		4,772	5,878	7,978	9,325	9,764	11,040

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,044	984	908	847	798	740	672
Final energy use - Residential (PJ)	591	552	524	495	458	408	352
Final energy use - Commercial (PJ)	441	434	424	414	399	379	356
Final energy use - Industry (PJ)	634	660	674	680	693	701	708

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion \$2018)		5.41	5.46	7.27	7.54	10.4	11

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	87.8	341	593	1,764	2,935	5,527	8,119
Vehicle stocks - LDV – All others (1000 units)	10,613	10,613	10,613	10,067	9,521	7,337	5,153
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million \$2018)		0	333	687	2,331	7,297	10,644
Public EV charging plugs - DC Fast (1000 units)	0.299		1.05		5.19		14.3
Public EV charging plugs - L2 (1000 units)	1.41		25.2		125		345

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 (%)	3.5	8.23	11.6	22.2	45.5	72.3	87.2
Sales of space heating units - Electric Resistance (%)	12.7	18.7	18.1	16.4	12.5	8.16	5.9
Sales of space heating units - Gas (%)	81.4	68.5	65.9	57.4	39	17.8	5.87
Sales of space heating units - Fossil (%)	2.45	4.6	4.47	3.97	2.93	1.72	1.01
Sales of water heating units - Electric Heat Pump (%)	0	0.582	2.2	7.34	18.4	30.9	37.9
Sales of water heating units - Electric Resistance (%)	22.7	38.3	38.8	40.9	46.2	52.8	56.7
Sales of water heating units - Gas Furnace (%)	77.3	61	58.9	51.7	35.3	16.1	5.22
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.113	0.113	0.112
Sales of cooking units - Electric Resistance (%)	50.6	51.9	56.4	68.3	84.9	95.1	98.7
Sales of cooking units - Gas (%)	49.4	48.1	43.6	31.7	15.1	4.87	1.31
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		10.7	14.3				

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 (%)	0.751	6.2	9.31	19.3	41.6	67.6	82.4
Sales of space heating units - Electric Resistance (%)	2.86	3.43	3.64	4.33	6.04	8.25	9.53
Sales of space heating units - Gas Furnace (%)	96.4	88	84.8	74.6	51.5	23.8	7.97
Sales of space heating units - Fossil (%)	0	2.4	2.27	1.73	0.88	0.287	0.075
Sales of water heating units - Electric Heat Pump (%)	0.271	1.04	2.99	9.2	22.7	38.2	46.9
Sales of water heating units - Electric Resistance (%)	2.65	3.78	5.32	10.5	22.3	36.6	44.8
Sales of water heating units - Gas Furnace (%)	96.9	95	91.5	80.1	54.8	25	8.1
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric Resistance (%)	41	45.8	49.8	60.5	75.4	84.5	87.7
Sales of cooking units - Gas (%)	59	54.2	50.2	39.5	24.6	15.5	12.3
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		40,922	44,666				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,459	1,811	0	0	0	0	0
Installed thermal - Natural gas (MW)	16,510	16,460	14,656	13,659	7,729	6,481	6,619
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	11,245	10,075	7,047	6,038

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion \$2018)	0	0	0	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion \$2018)	0	0	0	0.075	0	0	0
Capital invested - Biomass w/ccu power plant (billion \$2018)	0	0	1.9	1.4	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	2,136	3,710	3,710	3,710	3,710
Biomass w/ccu allam power plant (GWh)	0	0	0	74.6	74.6	74.6	74.6

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	4	4	4	4
Number of facilities - Allam power w ccu (quantity)	0	0	0	2	2	2	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	70	124	124	124
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	2	2	2	2
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	0
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	2	2	2	2
Number of facilities - Sng (quantity)	0	0	0	0	0	0	0
Number of facilities - Sng ccu (quantity)	0	0	2	2	2	2	2
Conversion capital investment - Cumulative 5-yr (million \$2018)		0	1,746	60,802	45,876	0	0
Biomass purchases (million \$2018/y)		0	151	6,164	10,720	10,720	10,720

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	2.13	83.5	142	142	143
Annual - BECCS (MMT)		0	2.12	80	139	139	139
Annual - NGCC (MMT)		0	0.01	0.09	0.11	0.08	0.03
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	2.13	85.6	228	371	513
Cumulative - BECCS (MMT)		0	2.12	82.2	221	360	499
Cumulative - NGCC (MMT)		0	0.01	0.1	0.21	0.29	0.32
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	958	1,324	2,045	2,045	2,045
Spur (km)		0	354	4,280	6,716	6,837	6,849
All (km)		0	1,311	5,604	8,760	8,881	8,894
Cumulative investment - Trunk (million \$2018)		0	6,269	8,888	13,401	13,401	13,401
Cumulative investment - Spur (million \$2018)		0	240	4,152	6,968	8,152	8,277
Cumulative investment - All (million \$2018)		0	6,509	13,041	20,368	21,553	21,678

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	2.77	13.9	27.3	38.4	40.1
Injection wells (wells)		0	7	26	46	78	96
Resource characterization, appraisal, permitting costs (million \$2020)		100	441	682	682	682	682
Wells and facilities construction costs (million \$2020)		0	200	781	1,392	2,327	2,890

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)							-47.9
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-44.9
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-93.2
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-55.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-45.5
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,217
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,715
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-366
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-418
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-6,654
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-71.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,570
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-1,679
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-80.8
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-90.9
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-2,347
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-4,073
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,599
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-828
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-14,157
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-95.6
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,692
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-2,426
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-108

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-1,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-3,477
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-5,430
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-4,831
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-21,662
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-1,239
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.82
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							342
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							474
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							20
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)							174
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							248
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,469
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							353
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							855
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							30
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)							252
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							269
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							172

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							500
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,444
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							364
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,237
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							39.9
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)							330
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							359
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							137
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							411
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,894

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)							-4,993
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-8,380
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-193
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)							-13,567
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-4,993
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-15,905

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-387
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)							-21,285
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							2,460
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							3,442
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							352
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							822
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							113
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							7,189
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							2,460
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							16,127
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							703
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							822
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							113
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							20,227

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)		432	268	187	151	137	135
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		46.3	53.8	66.9	67	71.1	63.5
Premature deaths from air pollution - Mobile - On-Road (deaths)		560	577	595	615	636	656
Premature deaths from air pollution - Gas Stations (deaths)		37	37.9	38.7	39.7	40.7	41.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		166	155	146	139	134	130
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.62	3.29	2.81	2.35	1.97	1.73
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.48	9.73	10.1	10.5	10.4	10.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		11.3	11.3	11.2	11.1	11	10.8
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		194	190	173	153	140	137
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		42.3	44.4	44.5	42.6	40.5	39.5
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		4.02	4.12	4.22	4.31	4.4	4.49
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		4.12	2.78	2.19	2.04	1.93	1.77
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		121	126	129	123	121	113
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million \$2019)		3,827	2,375	1,655	1,335	1,213	1,195
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million \$2019)		410	476	592	594	630	563
Monetary damages from air pollution - Mobile - On-Road (million \$2019)		4,980	5,129	5,287	5,472	5,655	5,836
Monetary damages from air pollution - Gas Stations (million \$2019)		327	335	342	352	360	367
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million \$2019)		1,473	1,377	1,290	1,230	1,191	1,152
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million \$2019)		32.1	29.2	24.9	20.8	17.4	15.3
Monetary damages from air pollution - Fuel Comb - Residential - Other (million \$2019)		84	86.2	89.7	92.7	92.5	91.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million \$2019)		99.9	99.9	99.4	98.4	97.3	95.8
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million \$2019)		1,716	1,679	1,534	1,353	1,242	1,214
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million \$2019)		374	393	394	377	358	349
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million \$2019)		35.6	36.5	37.4	38.2	38.9	39.7
Monetary damages from air pollution - Industrial Processes - Coal Mining (million \$2019)		36.4	24.5	19.3	18	17	15.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million \$2019)		1,072	1,122	1,143	1,092	1,079	1,001

Table 65: REF scenario - IMPACTS - Jobs

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		2,972	2,968	2,968	2,962	2,962	2,964
By economic sector - Construction (jobs)		12,038	12,353	14,035	14,580	16,156	18,035
By economic sector - Manufacturing (jobs)		7,249	7,335	7,390	7,779	7,607	7,640
By economic sector - Mining (jobs)		9,213	6,688	5,237	4,170	3,485	2,844
By economic sector - Other (jobs)		661	714	1,083	1,129	1,299	1,716
By economic sector - Pipeline (jobs)		1,084	1,132	1,150	1,090	1,104	1,096
By economic sector - Professional (jobs)		8,052	7,621	7,988	8,568	9,117	9,999
By economic sector - Trade (jobs)		7,183	6,314	6,258	6,240	6,457	6,972
By economic sector - Utilities (jobs)		19,583	18,762	18,728	18,809	20,062	20,935
By resource sector - Biomass (jobs)		7,006	6,807	6,626	6,460	6,323	6,198
By resource sector - CO2 (jobs)		0	0,079	0.1	0.108	0.119	0.127
By resource sector - Coal (jobs)		8,175	4,933	3,633	2,646	2,022	1,704
By resource sector - Grid (jobs)		19,787	19,227	20,069	20,279	25,338	28,914
By resource sector - Natural Gas (jobs)		10,934	10,657	11,192	12,670	11,442	10,706
By resource sector - Nuclear (jobs)		6,266	6,166	5,258	4,031	3,513	2,816
By resource sector - Oil (jobs)		11,725	10,286	9,223	8,536	8,075	7,584
By resource sector - Solar (jobs)			640	3,081	2,122	2,262	4,055
By resource sector - Wind (jobs)		4,142	5,173	5,756	8,582	9,273	10,224
By education level - All sectors - High school diploma or less (jobs)		29,977	28,047	28,463	28,524	29,833	31,532
By education level - All sectors - Associates degree or some college (jobs)		19,989	18,881	19,406	19,772	20,815	22,203
By education level - All sectors - Bachelors degree (jobs)		14,111	13,237	13,234	13,264	13,695	14,346
By education level - All sectors - Masters or professional degree (jobs)		3,476	3,267	3,276	3,301	3,425	3,608
By education level - All sectors - Doctoral degree (jobs)		482	455	459	466	482	510
Related work experience - All sectors - None (jobs)		9,849	9,305	9,501	9,604	10,060	10,668
Related work experience - All sectors - Up to 1 year (jobs)		14,434	13,533	13,722	13,746	14,326	15,131
Related work experience - All sectors - 1 to 4 years (jobs)		24,453	22,833	23,088	23,228	24,256	25,644
Related work experience - All sectors - 4 to 10 years (jobs)		15,206	14,350	14,621	14,814	15,509	16,438
Related work experience - All sectors - Over 10 years (jobs)		4,093	3,865	3,906	3,935	4,099	4,318
On-the-Job Training - All sectors - None (jobs)		3,702	3,483	3,523	3,515	3,645	3,847
On-the-Job Training - All sectors - Up to 1 year (jobs)		46,181	43,189	43,551	43,706	45,475	47,922
On-the-Job Training - All sectors - 1 to 4 years (jobs)		13,471	12,733	13,071	13,285	13,998	14,910
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,091	3,915	4,110	4,229	4,519	4,876
On-the-Job Training - All sectors - Over 10 years (jobs)		590	568	585	591	612	646
On-Site or In-Plant Training - All sectors - None (jobs)		10,609	10,035	10,218	10,316	10,741	11,368
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		42,014	39,252	39,582	39,707	41,349	43,591

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		10,593	9,991	10,232	10,373	10,917	11,616
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,282	4,090	4,263	4,368	4,643	4,982
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		538	519	543	562	599	643
Wage income - All (million \$2019)		4,180	3,983	4,100	4,191	4,454	4,779

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,044	993	935	904	914	947	988
Final energy use - Residential (PJ)	591	553	532	516	507	501	496
Final energy use - Commercial (PJ)	441	441	437	426	415	414	426
Final energy use - Industry (PJ)	634	673	695	715	742	766	795

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)		5.74	5.83	7.97	8.31	10.3	10.9

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 (%)	2.39	12.9	13.5	14.3	15	15.6	16.5
Sales of space heating units - Electric Resistance (%)	12.9	17.8	17.6	17.4	16.8	16	15.2
Sales of space heating units - Gas (%)	82.1	65.2	64.8	64.2	64.1	64.2	64
Sales of space heating units - Fossil (%)	2.6	4.13	4.15	4.15	4.16	4.19	4.17
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	22.7	38.1	37.9	37.8	37.8	37.7	37.7
Sales of water heating units - Gas Furnace (%)	77.3	61.8	62	62.1	62.1	62.2	62.2
Sales of water heating units - Other (%)	0.046	0.112	0.113	0.113	0.113	0.114	0.114
Sales of cooking units - Electric Resistance (%)	50.2	50.2	50.2	50.2	50.2	50.2	50.2
Sales of cooking units - Gas (%)	49.8	49.8	49.8	49.8	49.8	49.8	49.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion \$2018)		10.3	11.1				

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 (%)	0.751	12.5	44.7	71.1	75.5	75.9	75.9
Sales of space heating units - Electric Resistance (%)	2.86	4.31	8.93	17.1	22.7	23.6	23.7
Sales of space heating units - Gas Furnace (%)	96.4	81	45.2	11.6	1.78	0.443	0.362
Sales of space heating units - Fossil (%)	0	2.21	1.15	0.205	0.023	0	0
Sales of water heating units - Electric Heat Pump (%)	0.271	0.342	0.346	0.345	0.34	0.342	0.342
Sales of water heating units - Electric Resistance (%)	2.65	3.2	3.17	3.18	3.17	3.15	3.16
Sales of water heating units - Gas Furnace (%)	96.9	96.3	96.3	96.3	96.3	96.3	96.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	0.154	0.185	0.186	0.187	0.186	0.187	0.187
Sales of cooking units - Electric Resistance (%)	41	44.2	44.3	44.3	44.3	44.4	44.5
Sales of cooking units - Gas (%)	59	55.8	55.7	55.7	55.7	55.6	55.5
Commercial HVAC investment in 2020s - Cumulative 5-yr (million \$2018)		40,483	41,990				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	7,459	4,077	2,444	2,444	45	45	0
Installed thermal - Natural gas (MW)	16,504	16,977	16,077	16,971	13,442	22,579	26,270
Installed thermal - Nuclear (MW)	12,415	12,415	12,415	8,378	8,378	6,038	6,038
Installed renewables - Rooftop PV (MW)	62.5	110	164	248	368	523	724
Installed renewables - Solar - Base land use assumptions (MW)	305	305	305	1,496	2,649	3,485	5,272
Installed renewables - Wind - Base land use assumptions (MW)	6,784	6,948	8,722	9,430	15,304	19,114	25,260
Installed renewables - Wind - Constrained land use assumptions (MW)	65	65	65	65	65	65	65

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	650	650	650	2,871	5,021	6,577	9,900
Wind - Base land use assumptions (GWh)	24,893	25,438	31,451	33,851	52,673	64,877	84,316
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)	-11.1		-4.33				-3.87
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-0.371		-0.667				-0.694
Business-as-usual carbon sink - Total (Mt CO2e/y)	-11.5		-5				-4.57

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)							-479
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-449
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-932
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-55.1
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-455
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-1,217
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-2,715
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-366
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-418

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - All (not counting overlap) (1000 tCO ₂ e/y)							-6,654
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO ₂ e/y)							-71.7
Carbon sink potential - Mid - Avoid deforestation (1000 tCO ₂ e/y)							-1,570
Carbon sink potential - Mid - Extend rotation length (1000 tCO ₂ e/y)							-1,679
Carbon sink potential - Mid - Improve plantations (1000 tCO ₂ e/y)							-80.8
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO ₂ e/y)							-909
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO ₂ e/y)							-2,347
Carbon sink potential - Mid - Reforest cropland (1000 tCO ₂ e/y)							-4,073
Carbon sink potential - Mid - Reforest pasture (1000 tCO ₂ e/y)							-2,599
Carbon sink potential - Mid - Restore productivity (1000 tCO ₂ e/y)							-828
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO ₂ e/y)							-14,157
Carbon sink potential - High - Accelerate regeneration (1000 tCO ₂ e/y)							-95.6
Carbon sink potential - High - Avoid deforestation (1000 tCO ₂ e/y)							-2,692
Carbon sink potential - High - Extend rotation length (1000 tCO ₂ e/y)							-2,426
Carbon sink potential - High - Improve plantations (1000 tCO ₂ e/y)							-108
Carbon sink potential - High - Increase retention of HWP (1000 tCO ₂ e/y)							-1,364
Carbon sink potential - High - Increase trees outside forests (1000 tCO ₂ e/y)							-3,477
Carbon sink potential - High - Reforest cropland (1000 tCO ₂ e/y)							-5,430
Carbon sink potential - High - Reforest pasture (1000 tCO ₂ e/y)							-4,831
Carbon sink potential - High - All (not counting overlap) (1000 tCO ₂ e/y)							-21,662
Carbon sink potential - High - Restore productivity (1000 tCO ₂ e/y)							-1,239
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							7.82
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							342
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							474
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							20
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)							174

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							180
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							23.8
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							248
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							1,469
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							11.7
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							353
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							855
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							30
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)							252
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							269
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							172
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							500
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							2,444
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							15.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							364
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							1,237
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							39.9
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)							330
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							359
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							137

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							411
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							2,894