Net-Zero America - Illinois data

October 29, 2021 (updated November 17, 2023)

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

Contents

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 (%)	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 (%)	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
Capital invested - Wind - Base (billion $2018)		10.1	29	25.6	30.1	28	30.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion $2018)		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
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)							-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

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

Item	2020	2025	2030	2035	2040	2045	2050
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
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							353

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 - 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
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-9,245

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

Item	2020	2025	2030	2035	2040	2045	2050
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
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		9.84	10.2	10.3	9.82	8.12	5.98

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

Item	2020	2025	2030	2035	2040	2045	2050
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 (%)	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 (%)	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

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

Item	2020	2025	2030	2035	2040	2045	2050
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)							-47.9
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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
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

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 - 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
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

Table 26: *E- 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)							-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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 (%)	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 (%)	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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 tCO2e/y)							-47.9
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-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
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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		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
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

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		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
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 (%)	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 (%)	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
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
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)							-47.9
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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - 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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - 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 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

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - 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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 (%)	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 (%)	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
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)							-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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 (%)	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 (%)	96.9	96.3	96.3	96.3	96.3	96.3	96.3
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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)							-47.9
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

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

Item	2020	2025	2030	2035	2040	2045	2050
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 73: *REF 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