Net-Zero America - New York 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)		212	0.228	0.227	0.215	0.134	0.007
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		252	184	131	124	95.9	35.9
Premature deaths from air pollution - Mobile - On-Road (deaths)		823	813	653	397	188	74.4
Premature deaths from air pollution - Gas Stations (deaths)		51.2	49.4	38.8	23.6	11.4	4.84
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		459	413	304	182	92	36.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		173	147	104	62.6	28.4	8.24
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		27	25.6	20.7	14.6	8.51	4.56
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		4.39	4.3	4.2	4.08	3.94	3.78
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		210	203	168	121	79.4	44.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		45.9	39.2	29.1	18.8	13	9.75
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		9.23	8.13	6.93	5.63	4.29	2.91
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.92	1.04	1.06	1.08	1.13	1.15
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		147	138	123	97.4	70.7	43.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,881	2.02	2.01	1.9	1.18	0.064
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		2,231	1,632	1,159	1,101	849	318
Monetary damages from air pollution - Mobile - On-Road (million $2019)		7,317	7,231	5,804	3,530	1,675	662
Monetary damages from air pollution - Gas Stations (million $2019)		453	437	343	209	101	42.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,068	3,662	2,692	1,616	815	320
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1,534	1,303	924	555	252	73.1
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		240	227	184	129	75.4	40.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		38.8	38.1	37.2	36.1	34.9	33.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		1,861	1,795	1,488	1,070	703	393

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)		406	347	258	166	115	86.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		81.7	72	61.3	49.9	37.9	25.8
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		16.9	9.17	9.39	9.53	9.95	10.2
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,307	1,222	1,089	865	627	384

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		481	669	432	268	106	400
By economic sector - Construction (jobs)		20,440	21,337	26,486	31,946	38,153	45,770
By economic sector - Manufacturing (jobs)		6,921	8,482	10,733	10,260	11,877	16,371
By economic sector - Mining (jobs)		4,807	3,439	2,289	1,447	864	516
By economic sector - Other (jobs)		2,528	2,816	3,215	4,424	6,277	8,091
By economic sector - Pipeline (jobs)		1,235	1,063	877	669	460	416
By economic sector - Professional (jobs)		8,877	9,709	12,299	15,433	19,282	26,494
By economic sector - Trade (jobs)		6,740	6,787	7,866	9,610	12,131	15,960
By economic sector - Utilities (jobs)		16,075	16,512	26,590	32,247	37,657	60,547
By resource sector - Biomass (jobs)		1,481	1,701	1,050	700	400	1,756
By resource sector - CO2 (jobs)		0	120	359	357	356	1,028
By resource sector - Coal (jobs)		481	139	10.1	9.64	9.2	3.53
By resource sector - Grid (jobs)		16,450	21,706	44,364	54,262	63,369	76,676
By resource sector - Natural Gas (jobs)		14,747	10,460	8,380	9,432	7,326	5,695
By resource sector - Nuclear (jobs)		2,016	1,688	1,661	1,635	3,961	26,080
By resource sector - Oil (jobs)		10,343	8,327	6,120	4,320	3,031	2,063
By resource sector - Solar (jobs)		18,963	19,121	16,124	21,661	32,068	39,329
By resource sector - Wind (jobs)		3,620	7,552	12,719	13,925	16,288	21,934
By education level - All sectors - High school diploma or less (jobs)		28,841	30,149	38,510	44,810	53,157	71,550
By education level - All sectors - Associates degree or some college (jobs)		21,434	22,374	29,204	34,507	41,155	55,487
By education level - All sectors - Bachelors degree (jobs)		13,932	14,277	18,000	20,970	25,183	36,712
By education level - All sectors - Masters or professional degree (jobs)		3,398	3,501	4,453	5,271	6,389	9,425
By education level - All sectors - Doctoral degree (jobs)		496	513	620	745	923	1,390
Related work experience - All sectors - None (jobs)		9,895	10,294	13,246	15,547	18,491	25,046
Related work experience - All sectors - Up to 1 year (jobs)		13,600	14,292	18,101	21,088	25,244	34,603
Related work experience - All sectors - 1 to 4 years (jobs)		24,505	25,409	32,602	38,203	45,577	62,989
Related work experience - All sectors - 4 to 10 years (jobs)		15,945	16,501	21,269	24,990	29,770	41,004
Related work experience - All sectors - Over 10 years (jobs)		4,157	4,317	5,568	6,474	7,724	10,922
On-the-Job Training - All sectors - None (jobs)		3,759	3,875	4,820	5,642	6,821	9,699
On-the-Job Training - All sectors - Up to 1 year (jobs)		44,389	46,250	59,021	68,747	82,069	114,023

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)		14,494	15,047	19,607	23,143	27,509	37,199
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,788	4,947	6,483	7,786	9,228	11,998
On-the-Job Training - All sectors - Over 10 years (jobs)		671	696	854	985	1,180	1,645
On-Site or In-Plant Training - All sectors - None (jobs)		11,040	11,484	14,514	17,007	20,427	28,552
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		40,381	42,041	53,774	62,683	74,792	103,710
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		11,218	11,658	15,152	17,843	21,213	28,680
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,874	5,013	6,524	7,791	9,219	12,130
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		590	618	823	978	1,154	1,493
Wage income - All (million $2019)		4,314	4,508	5,889	7,005	8,449	11,957

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		230	202	160	122	91.3	66.3
Oil consumption - Cumulative (million bbls)							4,947
Oil production - Annual (million bbls)		0.286	0.287	0.287	0.227	0.185	0.123
Natural gas consumption - Annual (tcf)		1,045	881	707	532	335	232
Natural gas consumption - Cumulative (tcf)							21,286
Natural gas production - Annual (tcf)		14.4	13.6	11.9	10	7.95	6.18

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,161	1,104	995	858	731	647	604
Final energy use - Residential (PJ)	880	819	735	612	496	413	364
Final energy use - Commercial (PJ)	690	677	650	604	560	538	533
Final energy use - Industry (PJ)	488	505	512	521	523	530	532

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)		7.59	7.79	18.2	19.6	18.4	19.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	156	1,087	2,018	5,278	8,537	11,141	13,746
Vehicle stocks - LDV – All others (1000 units)	11,462	10,914	10,366	7,554	4,742	2,683	624
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		2,187	5,658	9,084	13,794	14,977	14,299
Public EV charging plugs - DC Fast (1000 units)	0.56		3.54		15		24.1
Public EV charging plugs - L2 (1000 units)	4.23		85.1		360		579

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 (%)	3.63	16.2	66.1	89	91.7	91.9	92
Sales of space heating units - Electric Resistance (%)	8.47	10.5	6.04	3.28	2.89	2.96	3.08
Sales of space heating units - Gas (%)	63.7	41.2	17.6	3.03	0.991	0.876	0.88
Sales of space heating units - Fossil (%)	24.2	32.1	10.3	4.74	4.39	4.24	4.06
Sales of water heating units - Electric Heat Pump (%)	0	6.54	37.2	51.7	53.5	53.6	53.6
Sales of water heating units - Electric Resistance (%)	18.7	35.7	39.8	45.4	46.3	46.4	46.3
Sales of water heating units - Gas Furnace (%)	71.1	52	21.9	2.85	0.155	0	0
Sales of water heating units - Other (%)	10.3	5.8	1.12	0.083	0.037	0.038	0.038
Sales of cooking units - Electric Resistance (%)	34.6	48.6	91.2	99.6	100	100	100
Sales of cooking units - Gas (%)	65.4	51.4	8.8	0.443	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		14.3	15.2				

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 (%)	0.625	15.6	51.1	76.3	79.8	80.3	80.2
Sales of space heating units - Electric Resistance (%)	2.13	4.73	12.8	18	19.1	18.8	18.9
Sales of space heating units - Gas (%)	78.2	65.2	33.3	5.6	1.11	0.87	0.863
Sales of space heating units - Fossil (%)	19.1	14.5	2.85	0.124	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.224	7.35	41	58.7	61	61.2	61.2
Sales of water heating units - Electric Resistance (%)	1.34	5.14	22.3	36.4	38.5	38.7	38.7
Sales of water heating units - Gas (%)	97	86.3	36.3	4.73	0.256	0	0
Sales of water heating units - Other (%)	1.45	1.19	0.377	0.184	0.175	0.176	0.176
Sales of cooking units - Electric Resistance (%)	18.5	33.7	75.3	83.5	83.9	84	84
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		89,684	98,037				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	1,642	993	28.6	28.6	28.6	28.6	0
Installed thermal - Natural gas (MW)	22,655	14,488	15,963	18,699	34,255	30,475	28,214
Installed thermal - Nuclear (MW)	4,410	3,398	3,398	3,398	3,399	3,830	14,525
Installed renewables - Rooftop PV (MW)	2,262	3,350	4,275	5,350	6,543	7,836	9,243
Installed renewables - Solar - Base land use assumptions (MW)	2,155	6,680	11,974	14,471	20,687	35,011	43,162
Installed renewables - Wind - Base land use assumptions (MW)	2,381	3,284	5,438	8,739	9,320	11,024	11,567
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	139	309	8,081	13,377	20,097	28,635
Installed renewables - Solar - Constrained land use assumptions (MW)	502	6,292	16,239	20,774	27,836	37,360	43,108
Installed renewables - Wind - Constrained land use assumptions (MW)	3,284	3,284	5,424	8,833	9,661	11,413	11,966
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	276	448	7,937	13,288	19,102	28,495

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Base (billion $2018)		6.82	6.34	2.75	6.46	14.1	7.55
Capital invested - Wind - Base (billion $2018)		0	5.05	7.37	1.23	3.44	1.04
Capital invested - Offshore Wind - Base (billion $2018)		0.393	0.409	15.9	10.9	11	11.3
Capital invested - Solar PV - Constrained (billion $2018)		11.5	11.2	5.23	7.17	8.6	3.67
Capital invested - Wind - Constrained (billion $2018)		0	8.47	7.67	1.8	3.59	1.05
Capital invested - Offshore Wind - Constrained (billion $2018)		0.782	0.412	15.4	10.8	9.53	12.4
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	0.005	0.001	0	0.013
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0.008	0	0.001	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)	2,912	11,655	20,663	24,823	35,288	59,625	73,457
Wind - Base land use assumptions (GWh)	14,244	14,244	22,135	34,055	36,123	42,123	44,018
OffshoreWind - Base land use assumptions (GWh)	0	562	1,250	32,760	54,963	83,187	119,377
Solar - Constrained land use assumptions (GWh)	935	10,867	27,846	35,424	47,307	63,297	72,937
Wind - Constrained land use assumptions (GWh)	14,244	14,244	22,057	34,233	37,112	43,214	45,113
OffshoreWind - Constrained land use assumptions (GWh)	0	562	1,250	32,760	54,963	83,187	119,377
Biomass power plant (GWh)	0	0	0	0	0	0	0
Biomass w/ccu power plant (GWh)	0	0	8.55	8.55	9.28	9.28	9.28
Biomass w/ccu allam power plant (GWh)	0	0	0	4.5	5.42	5.42	18.8

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	1	1	1	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	1	1	3
Number of facilities - Diesel (quantity)	0	0	0	0	0	0	0
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	2
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	0	2
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	1	1	1	1	2
Conversion capital investment - Cumulative 5-yr (million $2018)		0	7.03	19.2	4.22	0	4,926
Biomass purchases (million $2018/y)		0	0.322	0.902	1.04	1.04	235

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.01	3.38	3.35	3.45	7.35
Annual - BECCS (MMT)		0	0.01	0.02	0.02	0.02	3.8
Annual - NGCC (MMT)		0	0	0.01	0.01	0.01	0.01
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	0.01	3.39	6.74	10.2	17.5
Cumulative - BECCS (MMT)		0	0.01	0.03	0.05	0.07	3.87
Cumulative - NGCC (MMT)		0	0	0.01	0.02	0.03	0.04
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	63	63	63	63	63
Spur (km)		0	216	374	549	549	1,246
All (km)		0	279	437	612	612	1,309
Cumulative investment - Trunk (million $2018)		0	114	114	114	114	114
Cumulative investment - Spur (million $2018)		0	111	288	379	382	791
Cumulative investment - All (million $2018)		0	225	402	493	496	905

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-192
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-459
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,555
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-307
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,821
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-375
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-136
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-418
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-9,448
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-287
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,605

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,206
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,642
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-724
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-205
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,967
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,349
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-20,436
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-383
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,752
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,858
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-604
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-5,464
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,072
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-273
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,516
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,435
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,513
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							350
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,317
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							111
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)							53.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.02
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							705

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,603
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							361
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,182
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							167
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)							77.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							13.5
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							196
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,419
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,464
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							62.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							373
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,047
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							223
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							18
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							157
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,164
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,146

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)							-264
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,224
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-44.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,532
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-264
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,322
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-89.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,675
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							85.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							785
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							81.5
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							953
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							85.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,489
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							163
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,738

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)		212	0.228	0.227	0.215	0.134	0.007
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		248	140	63.4	25	6.42	8.81
Premature deaths from air pollution - Mobile - On-Road (deaths)		838	898	923	874	730	526
Premature deaths from air pollution - Gas Stations (deaths)		52.4	55.7	56.4	52.8	43.6	31.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		463	461	439	385	305	214
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		176	179	181	167	131	87.5
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		27.4	28.9	30	28.8	24.1	18
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		4.39	4.3	4.2	4.08	3.94	3.78
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		211	224	232	226	204	170
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		46.2	43.9	41.4	36.4	31.6	26.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		9.23	8.72	8.12	7.45	6.71	5.93
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.86	1.04	1.07	1.1	1.13	1.12
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		147	130	108	90.4	78	57.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,881	2.02	2.01	1.9	1.18	0.064
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		2,199	1,243	562	221	56.9	78.1
Monetary damages from air pollution - Mobile - On-Road (million $2019)		7,451	7,988	8,203	7,769	6,492	4,675
Monetary damages from air pollution - Gas Stations (million $2019)		464	493	500	468	386	275
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,102	4,088	3,893	3,409	2,700	1,897
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1,561	1,585	1,605	1,477	1,159	775
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		243	256	266	255	213	160
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		38.8	38.1	37.2	36.1	34.9	33.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		1,870	1,983	2,054	2,001	1,803	1,502
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		409	389	367	323	280	235
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		81.7	77.2	71.9	65.9	59.4	52.5
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		16.4	9.19	9.47	9.67	9.96	9.87

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,303	1,157	957	803	693	510

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		520	586	401	229	89.1	400
By economic sector - Construction (jobs)		20,559	21,028	22,609	26,502	39,381	46,704
By economic sector - Manufacturing (jobs)		7,006	8,574	9,393	9,190	14,039	19,083
By economic sector - Mining (jobs)		4,877	3,523	2,583	1,870	1,307	795
By economic sector - Other (jobs)		2,577	2,845	2,862	3,847	6,536	8,240
By economic sector - Pipeline (jobs)		1,239	1,043	905	776	655	646
By economic sector - Professional (jobs)		8,955	9,515	10,736	14,042	20,787	25,962
By economic sector - Trade (jobs)		6,837	6,833	7,246	8,834	13,063	16,236
By economic sector - Utilities (jobs)		15,741	15,313	20,431	28,694	41,553	48,786
By resource sector - Biomass (jobs)		1,541	1,451	1,015	673	379	1,701
By resource sector - CO2 (jobs)		0	206	615	612	610	1,762
By resource sector - Coal (jobs)		651	225	10.1	3.66	0	0
By resource sector - Grid (jobs)		15,576	19,775	32,051	37,475	61,567	76,247
By resource sector - Natural Gas (jobs)		14,789	9,210	6,942	5,761	5,617	4,508
By resource sector - Nuclear (jobs)		2,016	1,908	1,922	9,828	11,264	11,150
By resource sector - Oil (jobs)		10,452	8,869	7,534	6,164	4,842	3,259
By resource sector - Solar (jobs)		19,555	19,757	15,081	19,926	34,318	39,600
By resource sector - Wind (jobs)		3,731	7,861	11,994	13,543	18,813	28,625
By education level - All sectors - High school diploma or less (jobs)		28,954	29,496	32,684	38,966	57,127	69,385
By education level - All sectors - Associates degree or some college (jobs)		21,472	21,811	24,584	29,782	44,032	53,609
By education level - All sectors - Bachelors degree (jobs)		13,977	14,016	15,517	19,557	28,082	33,963
By education level - All sectors - Masters or professional degree (jobs)		3,408	3,429	3,830	4,947	7,123	8,629
By education level - All sectors - Doctoral degree (jobs)		500	507	549	734	1,046	1,268
Related work experience - All sectors - None (jobs)		9,921	10,045	11,214	13,518	19,846	24,133
Related work experience - All sectors - Up to 1 year (jobs)		13,670	14,025	15,455	18,673	27,373	33,364
Related work experience - All sectors - 1 to 4 years (jobs)		24,577	24,844	27,721	33,882	49,466	60,000
Related work experience - All sectors - 4 to 10 years (jobs)		15,979	16,120	18,042	22,078	32,238	39,065
Related work experience - All sectors - Over 10 years (jobs)		4,165	4,227	4,733	5,834	8,487	10,291
On-the-Job Training - All sectors - None (jobs)		3,778	3,817	4,164	5,191	7,530	9,107
On-the-Job Training - All sectors - Up to 1 year (jobs)		44,552	45,292	50,336	61,307	89,425	108,815
On-the-Job Training - All sectors - 1 to 4 years (jobs)		14,514	14,663	16,504	20,046	29,477	35,700
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,792	4,800	5,420	6,542	9,673	11,656
On-the-Job Training - All sectors - Over 10 years (jobs)		676	688	739	900	1,304	1,574
On-Site or In-Plant Training - All sectors - None (jobs)		11,088	11,261	12,418	15,299	22,324	27,140
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		40,518	41,158	45,807	55,773	81,392	98,958

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		11,237	11,370	12,774	15,475	22,751	27,570
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,878	4,872	5,479	6,627	9,734	11,713
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		589	599	685	812	1,208	1,473
Wage income - All (million $2019)		4,322	4,400	4,992	6,229	9,183	11,248

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,163	1,112	1,033	964	905	837	757
Final energy use - Residential (PJ)	880	823	783	735	664	579	494
Final energy use - Commercial (PJ)	690	679	673	667	654	636	618
Final energy use - Industry (PJ)	488	505	514	526	531	538	538

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)		6.03	6.04	8.86	9.2	14.7	15.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	121	394	667	1,933	3,200	6,002	8,804
Vehicle stocks - LDV – All others (1000 units)	11,509	11,509	11,509	10,916	10,324	7,956	5,588
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	363	742	2,526	7,889	11,514
Public EV charging plugs - DC Fast (1000 units)	0.56		1.17		5.61		15.4
Public EV charging plugs - L2 (1000 units)	4.23		28.1		135		371

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 (%)	3.63	7.47	12.9	28.9	55.2	75.3	83.7
Sales of space heating units - Electric Resistance (%)	8.47	11.2	10.6	9.22	6.74	4.65	3.8
Sales of space heating units - Gas (%)	63.7	45.1	42.4	34.7	21.5	10.4	5.47
Sales of space heating units - Fossil (%)	24.2	36.3	34	27.2	16.6	9.64	6.99
Sales of water heating units - Electric Heat Pump (%)	0	1.21	4.63	14.7	31.2	43.9	49.3
Sales of water heating units - Electric Resistance (%)	18.7	35.3	35.6	36.9	39.6	42.6	44.2
Sales of water heating units - Gas Furnace (%)	71.1	56.8	53.6	43.7	26.7	12.4	5.95
Sales of water heating units - Other (%)	10.3	6.7	6.2	4.75	2.54	1.09	0.587
Sales of cooking units - Electric Resistance (%)	34.4	36.1	42.1	57.9	80	93.5	98.3
Sales of cooking units - Gas (%)	65.6	63.9	57.9	42.1	20	6.47	1.74
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		14.3	16.3				

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 (%)	0.625	10	13.9	25.5	45.9	63.9	72.2
Sales of space heating units - Electric Resistance (%)	2.13	3.41	4.29	6.96	11.7	15.4	17.3
Sales of space heating units - Gas (%)	78.2	69.8	65.6	54.7	35.3	17.8	8.88
Sales of space heating units - Fossil (%)	19.1	16.8	16.2	12.8	7.04	2.9	1.58
Sales of water heating units - Electric Heat Pump (%)	0.224	1.65	5.4	16.4	34.9	49.5	55.9
Sales of water heating units - Electric Resistance (%)	1.34	2.6	4.47	10.1	20.3	29.6	34
Sales of water heating units - Gas (%)	97	94.4	88.8	72.4	44.1	20.6	9.85
Sales of water heating units - Other (%)	1.45	1.35	1.33	1.05	0.642	0.377	0.282
Sales of cooking units - Electric Resistance (%)	18.5	21.6	27.5	43	64.5	77.7	82.3
Sales of cooking units - Gas (%)	81.5	78.4	72.5	57	35.5	22.3	17.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		89,637	97,820				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	1,642	993	28.6	28.6	28.6	28.6	0
Installed thermal - Natural gas (MW)	22,658	14,293	13,298	12,830	12,846	9,237	10,654
Installed thermal - Nuclear (MW)	4,410	3,398	3,489	3,580	7,039	9,889	12,767

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)							-192
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-459
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,555
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-307
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,821
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-375
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-136
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-418
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-9,448
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-287
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,605
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,206
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,642
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-724

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-205
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,967
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,349
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-20,436
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-383
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,752
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,858
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-604
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-5,464
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,072
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-273
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,516
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,435
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,513
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							350
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,317
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							111
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)							53.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.02
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							705
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,603
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							47

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							361
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,182
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							167
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)							77.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							13.5
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							196
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,419
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,464
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							62.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							373
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,047
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							223
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							18
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							157
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,164
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,146

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)							-264

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,224
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-44.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,532
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-264
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,322
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-89.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,675
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							85.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							785
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							81.5
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							953
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							85.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,489
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							163
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,738

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)		212	0.228	0.227	0.215	0.134	0.007
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		239	174	98.7	81.2	34.1	7.95
Premature deaths from air pollution - Mobile - On-Road (deaths)		823	813	653	397	188	74.4
Premature deaths from air pollution - Gas Stations (deaths)		51.2	49.4	38.8	23.6	11.4	4.84
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		459	413	304	182	92	36.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		173	147	104	62.6	28.4	8.24

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		27	25.6	20.7	14.6	8.51	4.56
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		4.39	4.3	4.2	4.08	3.94	3.78
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		210	203	168	121	79.4	44.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		45.9	39.2	29.1	18.8	13	9.75
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		9.23	8.13	6.93	5.63	4.29	2.91
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		2.07	1.04	1.06	1.08	1.13	1.08
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		144	135	112	81.3	47	4.74
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,881	2.02	2.01	1.9	1.18	0.064
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		2,116	1,541	875	719	302	70.4
Monetary damages from air pollution - Mobile - On-Road (million $2019)		7,317	7,231	5,804	3,530	1,675	662
Monetary damages from air pollution - Gas Stations (million $2019)		453	437	343	209	101	42.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,068	3,662	2,692	1,616	815	320
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1,534	1,303	924	555	252	73.1
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		240	227	184	129	75.4	40.4
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		38.8	38.1	37.2	36.1	34.9	33.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		1,861	1,795	1,488	1,070	703	393
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		406	347	258	166	115	86.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		81.7	72	61.3	49.9	37.9	25.8
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		18.2	9.17	9.38	9.52	9.94	9.52
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,276	1,197	996	722	417	42.1

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		482	679	431	247	97.3	394
By economic sector - Construction (jobs)		22,033	23,286	35,004	39,377	46,754	59,277
By economic sector - Manufacturing (jobs)		7,251	9,176	14,974	12,703	15,735	20,776
By economic sector - Mining (jobs)		4,752	3,355	2,100	1,201	588	76.7
By economic sector - Other (jobs)		2,823	3,235	4,746	5,728	7,538	9,278
By economic sector - Pipeline (jobs)		1,201	1,005	711	470	273	105
By economic sector - Professional (jobs)		9,476	10,614	16,276	19,579	24,530	32,400
By economic sector - Trade (jobs)		7,098	7,312	10,217	11,961	15,045	19,595
By economic sector - Utilities (jobs)		16,674	16,878	32,461	37,552	43,448	59,861
By resource sector - Biomass (jobs)		1,412	1,753	1,025	662	374	1,784
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		481	139	10.1	9.64	3.59	0
By resource sector - Grid (jobs)		17,792	23,118	58,153	67,750	81,191	117,419
By resource sector - Natural Gas (jobs)		14,462	9,887	7,024	7,049	5,589	4,349
By resource sector - Nuclear (jobs)		2,016	1,557	1,347	1,326	1,015	346
By resource sector - Oil (jobs)		10,345	8,231	5,909	3,842	2,119	9.43
By resource sector - Solar (jobs)		21,459	22,696	26,292	28,785	37,059	37,862
By resource sector - Wind (jobs)		3,823	8,159	17,159	19,395	26,659	39,993
By education level - All sectors - High school diploma or less (jobs)		30,459	32,205	49,730	54,272	64,565	84,493
By education level - All sectors - Associates degree or some college (jobs)		22,632	23,891	37,709	41,830	50,165	65,826
By education level - All sectors - Bachelors degree (jobs)		14,606	15,165	22,989	25,383	30,416	39,813
By education level - All sectors - Masters or professional degree (jobs)		3,568	3,727	5,691	6,414	7,736	10,171
By education level - All sectors - Doctoral degree (jobs)		524	552	800	922	1,126	1,459
Related work experience - All sectors - None (jobs)		10,430	10,973	17,036	18,798	22,442	29,433
Related work experience - All sectors - Up to 1 year (jobs)		14,387	15,323	23,517	25,693	30,738	40,175
Related work experience - All sectors - 1 to 4 years (jobs)		25,806	27,070	41,891	46,249	55,298	72,488
Related work experience - All sectors - 4 to 10 years (jobs)		16,794	17,579	27,316	30,245	36,163	47,377
Related work experience - All sectors - Over 10 years (jobs)		4,372	4,595	7,159	7,835	9,368	12,289
On-the-Job Training - All sectors - None (jobs)		3,966	4,147	6,231	6,863	8,230	10,679
On-the-Job Training - All sectors - Up to 1 year (jobs)		46,747	49,318	76,030	83,347	99,688	130,749
On-the-Job Training - All sectors - 1 to 4 years (jobs)		15,296	16,044	25,221	27,993	33,434	43,823
On-the-Job Training - All sectors - 4 to 10 years (jobs)		5,070	5,284	8,323	9,419	11,228	14,681
On-the-Job Training - All sectors - Over 10 years (jobs)		711	747	1,113	1,197	1,429	1,830
On-Site or In-Plant Training - All sectors - None (jobs)		11,650	12,281	18,764	20,673	24,811	32,366
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		42,529	44,821	69,242	75,965	90,808	119,113
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		11,838	12,433	19,504	21,591	25,782	33,793
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		5,150	5,345	8,350	9,408	11,193	14,624
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		623	659	1,058	1,184	1,415	1,866
Wage income - All (million $2019)		4,540	4,795	7,533	8,464	10,222	13,599

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,161	1,104	995	858	731	647	604
Final energy use - Residential (PJ)	880	819	735	612	496	413	364
Final energy use - Commercial (PJ)	690	677	650	604	560	538	533
Final energy use - Industry (PJ)	488	505	512	521	523	530	532

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)		7.59	7.79	18.2	19.6	18.4	19.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV - EV (1000 units)	156	1,087	2,018	5,278	8,537	11,141	13,746
Vehicle stocks - LDV – All others (1000 units)	11,462	10,914	10,366	7,554	4,742	2,683	624
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		2,187	5,658	9,084	13,794	14,977	14,299
Public EV charging plugs - DC Fast (1000 units)	0.56		3.54		15		24.1
Public EV charging plugs - L2 (1000 units)	4.23		85.1		360		579

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 (%)	3.63	16.2	66.1	89	91.7	91.9	92
Sales of space heating units - Electric Resistance (%)	8.47	10.5	6.04	3.28	2.89	2.96	3.08
Sales of space heating units - Gas (%)	63.7	41.2	17.6	3.03	0.991	0.876	0.88
Sales of space heating units - Fossil (%)	24.2	32.1	10.3	4.74	4.39	4.24	4.06
Sales of water heating units - Electric Heat Pump (%)	0	6.54	37.2	51.7	53.5	53.6	53.6
Sales of water heating units - Electric Resistance (%)	18.7	35.7	39.8	45.4	46.3	46.4	46.3
Sales of water heating units - Gas Furnace (%)	71.1	52	21.9	2.85	0.155	0	0
Sales of water heating units - Other (%)	10.3	5.8	1.12	0.083	0.037	0.038	0.038
Sales of cooking units - Electric Resistance (%)	34.6	48.6	91.2	99.6	100	100	100
Sales of cooking units - Gas (%)	65.4	51.4	8.8	0.443	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		14.3	15.2				

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 (%)	0.625	15.6	51.1	76.3	79.8	80.3	80.2
Sales of space heating units - Electric Resistance (%)	2.13	4.73	12.8	18	19.1	18.8	18.9
Sales of space heating units - Gas (%)	78.2	65.2	33.3	5.6	1.11	0.87	0.863
Sales of space heating units - Fossil (%)	19.1	14.5	2.85	0.124	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.224	7.35	41	58.7	61	61.2	61.2
Sales of water heating units - Electric Resistance (%)	1.34	5.14	22.3	36.4	38.5	38.7	38.7
Sales of water heating units - Gas (%)	97	86.3	36.3	4.73	0.256	0	0
Sales of water heating units - Other (%)	1.45	1.19	0.377	0.184	0.175	0.176	0.176

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of cooking units - Electric Resistance (%)	18.5	33.7	75.3	83.5	83.9	84	84
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		89,684	98,037				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	1,642	993	28.6	28.6	28.6	0	0
Installed thermal - Natural gas (MW)	22,780	14,968	15,595	17,729	28,320	24,804	22,239
Installed thermal - Nuclear (MW)	4,410	3,398	2,757	2,757	2,757	1,259	0
Installed renewables - Rooftop PV (MW)	2,262	3,350	4,275	5,350	6,543	7,836	9,243
Installed renewables - Solar - Base land use assumptions (MW)	2,251	8,767	15,348	24,283	32,896	45,191	49,822
Installed renewables - Wind - Base land use assumptions (MW)	3,284	3,284	5,438	9,320	10,718	14,723	17,362
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	139	309	12,773	21,321	32,657	54,102
Installed renewables - Solar - Constrained land use assumptions (MW)	1,695	10,801	18,130	25,729	34,147	44,054	48,474
Installed renewables - Wind - Constrained land use assumptions (MW)	3,772	3,772	5,867	10,104	11,586	15,429	17,782
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	276	448	12,684	19,162	19,162	48,394
Capital invested - Solar PV - Base (billion $2018)		8.73	8.17	9.85	8.95	12.1	4.29
Capital invested - Wind - Base (billion $2018)		0	5.05	8.67	2.98	8.08	5.03
Capital invested - Offshore Wind - Base (billion $2018)		0.393	0.409	25.7	17.3	18.6	28.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	4,001	15,206	26,732	41,754	56,384	77,233	85,092
Wind - Base land use assumptions (GWh)	14,244	14,244	22,135	36,123	41,060	54,852	63,691
OffshoreWind - Base land use assumptions (GWh)	0	562	1,250	52,451	88,396	136,296	230,708
Solar - Constrained land use assumptions (GWh)	6,158	37,136	61,989	87,519	115,785	149,206	164,118
Wind - Constrained land use assumptions (GWh)	28,488	28,488	44,113	74,224	84,489	110,679	126,529
OffshoreWind - Constrained land use assumptions (GWh)	0	2,243	3,631	103,763	158,978	158,978	413,290

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)							-192
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-459
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,555
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-307
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,821

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-375
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-136
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-418
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-9,448
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-287
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,605
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,206
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,642
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-724
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-205
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,967
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,349
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-20,436
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-383
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,752
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,858
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-604
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-5,464
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,072
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-273
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,516
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,435
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,513
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							350
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,317

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							111
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)							53.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.02
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							705
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,603
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							361
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,182
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							167
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)							77.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							13.5
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							196
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,419
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,464
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							62.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							373
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,047
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							223
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							18
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							157
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,164
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,146

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)							-264
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,224
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-44.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,532
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-264
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,322
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-89.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,675
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							85.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							785
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							81.5
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							953
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							85.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,489
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							163

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,738

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)		212	0.228	0.227	0.215	0.134	0.007
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		240	147	178	157	109	17.6
Premature deaths from air pollution - Mobile - On-Road (deaths)		823	813	653	397	188	74.4
Premature deaths from air pollution - Gas Stations (deaths)		51.2	49.4	38.8	23.6	11.4	4.84
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		459	413	304	182	92	36.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		173	147	104	62.6	28.4	8.24
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		27	25.6	20.7	14.6	8.51	4.56
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		4.39	4.3	4.2	4.08	3.94	3.78
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		210	203	168	121	79.4	44.3
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		45.9	39.2	29.1	18.8	13	9.75
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		9.23	8.13	6.93	5.63	4.29	2.91
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.77	1.04	1.06	1.08	1.13	1.08
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		150	146	145	130	112	85.8
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,881	2.02	2.01	1.9	1.18	0.064
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		2,124	1,301	1,573	1,388	962	156
Monetary damages from air pollution - Mobile - On-Road (million $2019)		7,317	7,231	5,804	3,530	1,675	662
Monetary damages from air pollution - Gas Stations (million $2019)		453	437	343	209	101	42.9
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,068	3,662	2,692	1,616	815	320
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1,534	1,303	924	555	252	73.1
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		240	227	184	129	75.4	40.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		38.8	38.1	37.2	36.1	34.9	33.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		1,861	1,795	1,488	1,070	703	393
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		406	347	258	166	115	86.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		81.7	72	61.3	49.9	37.9	25.8
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		15.6	9.16	9.38	9.52	9.95	9.51
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,329	1,296	1,290	1,152	991	762

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		507	600	392	241	101	405
By economic sector - Construction (jobs)		17,345	15,857	20,590	21,442	21,417	34,482
By economic sector - Manufacturing (jobs)		8,288	6,218	7,624	6,120	5,498	9,108
By economic sector - Mining (jobs)		4,863	3,526	2,488	1,684	1,113	758
By economic sector - Other (jobs)		1,823	1,643	2,216	2,449	2,743	6,951
By economic sector - Pipeline (jobs)		1,269	1,139	1,087	947	776	804
By economic sector - Professional (jobs)		7,809	7,175	8,911	10,460	11,906	17,700
By economic sector - Trade (jobs)		6,003	5,272	6,004	6,406	6,907	11,595
By economic sector - Utilities (jobs)		16,454	15,549	22,682	29,722	36,011	35,925
By resource sector - Biomass (jobs)		1,428	1,451	997	682	404	1,730
By resource sector - CO2 (jobs)		0	232	695	692	689	1,991
By resource sector - Coal (jobs)		481	133	1.06	1.01	0.965	0.37
By resource sector - Grid (jobs)		17,136	19,241	34,533	36,539	35,158	46,930
By resource sector - Natural Gas (jobs)		15,165	11,418	10,669	11,115	9,756	7,951
By resource sector - Nuclear (jobs)		2,016	1,688	1,662	9,147	18,865	11,248
By resource sector - Oil (jobs)		10,341	8,327	6,120	4,319	3,133	2,387
By resource sector - Solar (jobs)		12,479	8,949	10,424	10,593	11,633	37,918
By resource sector - Wind (jobs)		5,313	5,538	6,892	6,383	6,832	7,570
By education level - All sectors - High school diploma or less (jobs)		27,151	24,143	30,584	32,952	34,996	49,042
By education level - All sectors - Associates degree or some college (jobs)		20,245	17,971	23,163	25,420	27,282	37,771
By education level - All sectors - Bachelors degree (jobs)		13,303	11,627	14,268	16,392	18,702	23,899
By education level - All sectors - Masters or professional degree (jobs)		3,209	2,839	3,506	4,132	4,798	6,109
By education level - All sectors - Doctoral degree (jobs)		451	398	472	576	693	905
Related work experience - All sectors - None (jobs)		9,341	8,314	10,558	11,532	12,359	17,131
Related work experience - All sectors - Up to 1 year (jobs)		12,735	11,280	14,207	15,466	16,707	23,535
Related work experience - All sectors - 1 to 4 years (jobs)		23,211	20,544	25,902	28,725	31,383	42,349
Related work experience - All sectors - 4 to 10 years (jobs)		15,090	13,346	16,910	18,801	20,529	27,532

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - Over 10 years (jobs)		3,983	3,495	4,415	4,949	5,494	7,179
On-the-Job Training - All sectors - None (jobs)		3,503	3,072	3,794	4,277	4,801	6,532
On-the-Job Training - All sectors - Up to 1 year (jobs)		42,164	37,226	46,706	51,525	56,292	76,412
On-the-Job Training - All sectors - 1 to 4 years (jobs)		13,661	12,153	15,628	17,239	18,569	25,263
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,404	3,985	5,195	5,697	6,000	8,408
On-the-Job Training - All sectors - Over 10 years (jobs)		628	542	669	734	809	1,112
On-Site or In-Plant Training - All sectors - None (jobs)		10,385	9,135	11,421	12,737	14,073	19,189
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		38,331	33,875	42,607	46,999	51,286	69,579
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		10,579	9,406	12,067	13,263	14,262	19,490
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,508	4,061	5,241	5,766	6,118	8,434
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		556	501	657	706	732	1,034
Wage income - All (million $2019)		4,080	3,671	4,702	5,341	5,969	7,983

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,161	1,104	995	858	731	647	604
Final energy use - Residential (PJ)	880	819	735	612	496	413	364
Final energy use - Commercial (PJ)	690	677	650	604	560	538	533
Final energy use - Industry (PJ)	488	505	512	521	523	530	532

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)		7.59	7.79	18.2	19.6	18.4	19.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	156	1,087	2,018	5,278	8,537	11,141	13,746
Vehicle stocks - LDV – All others (1000 units)	11,462	10,914	10,366	7,554	4,742	2,683	624
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		2,187	5,658	9,084	13,794	14,977	14,299
Public EV charging plugs - DC Fast (1000 units)	0.56		3.54		15		24.1
Public EV charging plugs - L2 (1000 units)	4.23		85.1		360		579

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 (%)	3.63	16.2	66.1	89	91.7	91.9	92
Sales of space heating units - Electric Resistance (%)	8.47	10.5	6.04	3.28	2.89	2.96	3.08
Sales of space heating units - Gas (%)	63.7	41.2	17.6	3.03	0.991	0.876	0.88
Sales of space heating units - Fossil (%)	24.2	32.1	10.3	4.74	4.39	4.24	4.06

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0	6.54	37.2	51.7	53.5	53.6	53.6
Sales of water heating units - Electric Resistance (%)	18.7	35.7	39.8	45.4	46.3	46.4	46.3
Sales of water heating units - Gas Furnace (%)	71.1	52	21.9	2.85	0.155	0	0
Sales of water heating units - Other (%)	10.3	5.8	1.12	0.083	0.037	0.038	0.038
Sales of cooking units - Electric Resistance (%)	34.6	48.6	91.2	99.6	100	100	100
Sales of cooking units - Gas (%)	65.4	51.4	8.8	0.443	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		14.3	15.2				

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 (%)	0.625	15.6	51.1	76.3	79.8	80.3	80.2
Sales of space heating units - Electric Resistance (%)	2.13	4.73	12.8	18	19.1	18.8	18.9
Sales of space heating units - Gas (%)	78.2	65.2	33.3	5.6	1.11	0.87	0.863
Sales of space heating units - Fossil (%)	19.1	14.5	2.85	0.124	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.224	7.35	41	58.7	61	61.2	61.2
Sales of water heating units - Electric Resistance (%)	1.34	5.14	22.3	36.4	38.5	38.7	38.7
Sales of water heating units - Gas (%)	97	86.3	36.3	4.73	0.256	0	0
Sales of water heating units - Other (%)	1.45	1.19	0.377	0.184	0.175	0.176	0.176
Sales of cooking units - Electric Resistance (%)	18.5	33.7	75.3	83.5	83.9	84	84
Sales of cooking units - Gas (%)	81.5	66.3	24.7	16.5	16.1	16	16
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		89,684	98,037				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	1,642	993	3	3	3	3	0
Installed thermal - Natural gas (MW)	22,618	14,288	17,384	21,870	31,069	27,401	25,317
Installed thermal - Nuclear (MW)	4,410	3,398	3,398	3,399	6,604	12,838	14,592
Installed renewables - Rooftop PV (MW)	2,262	3,350	4,275	5,350	6,543	7,836	9,243
Installed renewables - Solar - Base land use assumptions (MW)	1,770	3,077	3,154	3,913	4,547	6,200	21,559
Installed renewables - Wind - Base land use assumptions (MW)	3,284	3,284	3,284	3,936	5,913	8,535	10,412
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	2,517	5,120	9,765	11,219	11,271	13,433
Installed renewables - Solar - Constrained land use assumptions (MW)	993	1,397	1,397	1,983	3,128	4,436	23,861
Installed renewables - Wind - Constrained land use assumptions (MW)	3,484	3,484	3,514	4,094	6,121	8,742	10,604
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	2,625	5,214	9,983	11,439	11,439	13,408
Capital invested - Solar PV - Base (billion $2018)		1.75	0.092	0.837	0.659	1.62	14.5
Capital invested - Wind - Base (billion $2018)		0	0	1.36	4.2	5.29	3.58
Capital invested - Offshore Wind - Base (billion $2018)		7.13	6.26	9.69	2.94	0.085	2.86

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Solar PV - Constrained (billion $2018)		0.54	0	0.646	1.19	1.28	18
Capital invested - Wind - Constrained (billion $2018)		0	0.072	1.29	4.31	5.29	3.55
Capital invested - Offshore Wind - Constrained (billion $2018)		7.43	6.23	9.75	2.95	0	2.61

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	3,185	5,445	5,572	6,857	7,941	10,748	37,215
Wind - Base land use assumptions (GWh)	14,244	14,244	14,244	16,565	23,892	33,329	39,994
OffshoreWind - Base land use assumptions (GWh)	0	10,024	20,550	40,051	46,037	46,254	55,195
Solar - Constrained land use assumptions (GWh)	1,883	2,594	2,594	3,592	5,589	7,799	40,573
Wind - Constrained land use assumptions (GWh)	14,244	14,244	14,355	16,576	24,025	33,355	39,881
OffshoreWind - Constrained land use assumptions (GWh)	0	10,664	21,171	40,651	46,697	46,697	54,922

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)							-192
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-459
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,555
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-307
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,821
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-375
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-136
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-418
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-9,448
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-287
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,605
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,206
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,642
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-724
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-205
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,967

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,349
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-20,436
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-383
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,752
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,858
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-604
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-5,464
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,072
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-273
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,516
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,435
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,513
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							350
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,317
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							111
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)							53.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.02
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							705
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,603
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							361
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,182

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							167
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)							77.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							13.5
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							196
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,419
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,464
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							62.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							373
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,047
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							223
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							18
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							157
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,164
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,146

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)							-264
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,224
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-44.8
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,532

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-264
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,322
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-89.7
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,675
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							85.7
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							785
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							81.5
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							953
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							85.7
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							1,489
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							163
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							1,738

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)		212	0.228	0.227	0.215	0.134	0.007
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		251	138	73.4	62.3	43.6	12.3
Premature deaths from air pollution - Mobile - On-Road (deaths)		838	898	923	874	730	526
Premature deaths from air pollution - Gas Stations (deaths)		52.4	55.7	56.4	52.8	43.6	31.1
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		463	461	439	385	305	214
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		176	179	181	167	131	87.5
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		27.4	28.9	30	28.8	24.1	18
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		4.39	4.3	4.2	4.08	3.94	3.78
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		211	224	232	226	204	170

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		46.2	43.9	41.4	36.4	31.6	26.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		9.23	8.72	8.12	7.45	6.71	5.93
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.91	1.04	1.07	1.1	1.14	1.16
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		147	130	108	90.4	78	57.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		1,881	2.02	2.01	1.9	1.18	0.064
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		2,222	1,223	650	552	386	109
Monetary damages from air pollution - Mobile - On-Road (million $2019)		7,451	7,988	8,203	7,769	6,492	4,675
Monetary damages from air pollution - Gas Stations (million $2019)		464	493	500	468	386	275
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,102	4,088	3,893	3,409	2,700	1,897
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1,561	1,585	1,605	1,477	1,159	775
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		243	256	266	255	213	160
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		38.8	38.1	37.2	36.1	34.9	33.5
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		1,870	1,983	2,054	2,001	1,803	1,502
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		409	389	367	323	280	235
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		81.7	77.2	71.9	65.9	59.4	52.5
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		16.9	9.19	9.47	9.68	10.1	10.2
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,303	1,157	957	803	693	510

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		502	584	396	236	94.1	928
By economic sector - Construction (jobs)		20,409	21,062	21,690	22,725	30,153	40,795
By economic sector - Manufacturing (jobs)		6,965	8,618	8,628	6,867	9,673	16,068
By economic sector - Mining (jobs)		4,821	3,520	2,597	1,939	1,302	756
By economic sector - Other (jobs)		2,558	2,839	2,732	3,288	4,957	7,391
By economic sector - Pipeline (jobs)		1,226	1,042	919	798	644	628
By economic sector - Professional (jobs)		8,884	9,534	10,250	11,141	15,021	24,038

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		6,767	6,846	6,986	7,487	9,879	14,516
By economic sector - Utilities (jobs)		15,547	15,271	19,334	19,719	26,809	48,557
By resource sector - Biomass (jobs)		1,506	1,448	1,007	701	426	4,424
By resource sector - CO2 (jobs)		0	211	631	628	626	1,808
By resource sector - Coal (jobs)		481	139	10.1	9.64	9.2	3.53
By resource sector - Grid (jobs)		15,398	19,849	30,175	31,088	46,237	63,942
By resource sector - Natural Gas (jobs)		14,612	9,436	6,998	6,506	5,964	4,281
By resource sector - Nuclear (jobs)		2,016	1,688	1,661	1,635	1,486	18,943
By resource sector - Oil (jobs)		10,452	8,869	7,534	6,417	4,876	3,110
By resource sector - Solar (jobs)		19,398	19,587	14,342	16,977	25,561	37,275
By resource sector - Wind (jobs)		3,816	8,090	11,173	10,235	13,347	19,888
By education level - All sectors - High school diploma or less (jobs)		28,675	29,524	31,157	31,254	41,469	63,462
By education level - All sectors - Associates degree or some college (jobs)		21,272	21,845	23,416	23,771	31,882	48,674
By education level - All sectors - Bachelors degree (jobs)		13,857	14,013	14,785	14,889	19,538	32,097
By education level - All sectors - Masters or professional degree (jobs)		3,379	3,427	3,651	3,736	4,927	8,214
By education level - All sectors - Doctoral degree (jobs)		497	506	524	549	718	1,228
Related work experience - All sectors - None (jobs)		9,827	10,057	10,694	10,812	14,382	22,114
Related work experience - All sectors - Up to 1 year (jobs)		13,542	14,032	14,719	14,789	19,666	30,777
Related work experience - All sectors - 1 to 4 years (jobs)		24,347	24,862	26,422	26,695	35,415	55,331
Related work experience - All sectors - 4 to 10 years (jobs)		15,835	16,136	17,196	17,398	23,092	35,913
Related work experience - All sectors - Over 10 years (jobs)		4,128	4,229	4,501	4,505	5,978	9,541
On-the-Job Training - All sectors - None (jobs)		3,745	3,816	3,970	4,022	5,313	8,547
On-the-Job Training - All sectors - Up to 1 year (jobs)		44,136	45,319	47,943	48,153	63,844	100,695
On-the-Job Training - All sectors - 1 to 4 years (jobs)		14,381	14,683	15,732	15,966	21,302	32,505
On-the-Job Training - All sectors - 4 to 10 years (jobs)		4,747	4,810	5,183	5,358	7,150	10,475
On-the-Job Training - All sectors - Over 10 years (jobs)		670	688	704	701	923	1,453
On-Site or In-Plant Training - All sectors - None (jobs)		10,990	11,267	11,827	11,952	15,870	25,171
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		40,139	41,183	43,636	43,855	58,164	91,483
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		11,134	11,385	12,176	12,335	16,449	25,114
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		4,833	4,881	5,240	5,390	7,154	10,594
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		584	600	654	666	895	1,314
Wage income - All (million $2019)		4,283	4,403	4,761	4,882	6,542	10,439

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,163	1,112	1,033	964	905	837	757
Final energy use - Residential (PJ)	880	823	783	735	664	579	494
Final energy use - Commercial (PJ)	690	679	673	667	654	636	618
Final energy use - Industry (PJ)	488	505	514	526	531	538	538

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)		6.03	6.04	8.86	9.2	14.7	15.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	121	394	667	1,933	3,200	6,002	8,804
Vehicle stocks - LDV – All others (1000 units)	11,509	11,509	11,509	10,916	10,324	7,956	5,588
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	363	742	2,526	7,889	11,514
Public EV charging plugs - DC Fast (1000 units)	0.56		1.17		5.61		15.4
Public EV charging plugs - L2 (1000 units)	4.23		28.1		135		371

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 (%)	3.63	7.47	12.9	28.9	55.2	75.3	83.7
Sales of space heating units - Electric Resistance (%)	8.47	11.2	10.6	9.22	6.74	4.65	3.8
Sales of space heating units - Gas (%)	63.7	45.1	42.4	34.7	21.5	10.4	5.47
Sales of space heating units - Fossil (%)	24.2	36.3	34	27.2	16.6	9.64	6.99
Sales of water heating units - Electric Heat Pump (%)	0	1.21	4.63	14.7	31.2	43.9	49.3
Sales of water heating units - Electric Resistance (%)	18.7	35.3	35.6	36.9	39.6	42.6	44.2
Sales of water heating units - Gas Furnace (%)	71.1	56.8	53.6	43.7	26.7	12.4	5.95
Sales of water heating units - Other (%)	10.3	6.7	6.2	4.75	2.54	1.09	0.587
Sales of cooking units - Electric Resistance (%)	34.4	36.1	42.1	57.9	80	93.5	98.3
Sales of cooking units - Gas (%)	65.6	63.9	57.9	42.1	20	6.47	1.74
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		14.3	16.3				

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 (%)	0.625	10	13.9	25.5	45.9	63.9	72.2
Sales of space heating units - Electric Resistance (%)	2.13	3.41	4.29	6.96	11.7	15.4	17.3
Sales of space heating units - Gas (%)	78.2	69.8	65.6	54.7	35.3	17.8	8.88
Sales of space heating units - Fossil (%)	19.1	16.8	16.2	12.8	7.04	2.9	1.58
Sales of water heating units - Electric Heat Pump (%)	0.224	1.65	5.4	16.4	34.9	49.5	55.9
Sales of water heating units - Electric Resistance (%)	1.34	2.6	4.47	10.1	20.3	29.6	34
Sales of water heating units - Gas (%)	97	94.4	88.8	72.4	44.1	20.6	9.85
Sales of water heating units - Other (%)	1.45	1.35	1.33	1.05	0.642	0.377	0.282
Sales of cooking units - Electric Resistance (%)	18.5	21.6	27.5	43	64.5	77.7	82.3
Sales of cooking units - Gas (%)	81.5	78.4	72.5	57	35.5	22.3	17.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		89,637	97,820				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	1,642	1,642	28.6	28.6	0	0	0
Installed thermal - Natural gas (MW)	22,657	14,490	13,442	13,449	16,736	13,344	11,703
Installed thermal - Nuclear (MW)	4,410	3,398	3,398	3,398	3,399	2,757	10,530
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	0.005	0.001	0	0.011
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0.007	0	0.001	0	0.011

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	8.38	8.38	9.01	9.12	21.7
Biomass w/ccu allam power plant (GWh)	0	0	0	4.49	5.23	5.45	16.9

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	1	1	1	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel (quantity)	0	0	0	0	0	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	0	0	1	13
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	1	1	1	1	1
Conversion capital investment - Cumulative 5-yr (million $2018)		0	6.95	22.2	4.22	47.7	12,245
Biomass purchases (million $2018/y)		0	0.652	1.94	2.2	6.27	1,070

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.01	3.38	3.35	3.45	3.67
Annual - BECCS (MMT)		0	0.01	0.02	0.02	0.03	0.12
Annual - NGCC (MMT)		0	0	0.01	0.01	0.01	0.01
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	0.01	3.39	6.74	10.2	13.9
Cumulative - BECCS (MMT)		0	0.01	0.03	0.05	0.08	0.2
Cumulative - NGCC (MMT)		0	0	0.01	0.02	0.03	0.04
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	63	63	63	63	63
Spur (km)		0	216	549	549	374	549
All (km)		0	279	612	612	437	612
Cumulative investment - Trunk (million $2018)		0	114	114	114	114	114
Cumulative investment - Spur (million $2018)		0	109	376	375	286	385

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative investment - All (million $2018)		0	223	490	489	400	499

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-192
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-459
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,555
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-307
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,821
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-375
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-136
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-418
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-9,448
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-287
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,605
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,206
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,642
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-724
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-205
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,967
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,349
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-20,436
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-383
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,752

Table 62: *E-B+ 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)							-11,858
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-604
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-5,464
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,072
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-273
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,516
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,435
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,513
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							350
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,317
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							111
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)							53.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.02
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							705
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,603
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							361
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,182
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							167
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)							77.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							13.5
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							196
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,419
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,464
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							62.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							373
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,047
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							223
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)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							18
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							157
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,164
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,146

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)							-414
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,160
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-42.4
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,616

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-414
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-2,200
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-84.9
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,698
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							744
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							77.2
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							1.31
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							78.3
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,072
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							172
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,483
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							154
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							1.31
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							78.3
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,889

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)		583	364	336	325	319	286

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		187	180	246	244	279	309
Premature deaths from air pollution - Mobile - On-Road (deaths)		836	909	981	1,061	1,143	1,231
Premature deaths from air pollution - Gas Stations (deaths)		52.1	56.1	60	64.4	68.8	73.1
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		454	459	470	490	513	531
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		170	150	113	79	53.2	38.1
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		26.4	27.3	28.1	29.2	30.2	31.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		4.58	4.71	4.82	4.92	5.02	5.09
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		213	231	242	251	272	306
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		46.4	43.4	38.2	30.1	25.1	22.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		9.65	10.3	11	11.7	12.4	13.1
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		3.61	2.71	2.36	2.32	2.34	2.29
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		148	163	172	169	173	171
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		5,166	3,222	2,981	2,884	2,824	2,537
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		1,653	1,596	2,181	2,162	2,472	2,733
Monetary damages from air pollution - Mobile - On-Road (million $2019)		7,434	8,078	8,725	9,431	10,167	10,949
Monetary damages from air pollution - Gas Stations (million $2019)		462	497	531	571	609	647
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,026	4,069	4,169	4,340	4,544	4,706
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		1,503	1,331	1,005	700	472	338
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		234	242	249	258	268	277
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		40.6	41.7	42.7	43.6	44.5	45.1
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		1,889	2,049	2,138	2,221	2,410	2,710
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		410	384	338	267	222	197

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		85.4	91.6	97.8	104	110	116
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		31.9	24	20.8	20.5	20.6	20.2
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,313	1,444	1,530	1,496	1,539	1,515

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		491	471	469	437	437	449
By economic sector - Construction (jobs)		9,942	13,759	16,430	16,835	18,156	23,849
By economic sector - Manufacturing (jobs)		4,560	4,945	7,383	5,162	5,450	8,355
By economic sector - Mining (jobs)		4,948	4,059	3,353	2,735	2,328	1,947
By economic sector - Other (jobs)		451	1,363	1,699	1,887	2,113	3,951
By economic sector - Pipeline (jobs)		1,265	1,323	1,345	1,271	1,287	1,278
By economic sector - Professional (jobs)		5,098	5,892	7,006	7,339	8,049	10,808
By economic sector - Trade (jobs)		4,396	4,806	5,265	5,407	5,809	7,920
By economic sector - Utilities (jobs)		14,507	12,859	16,665	17,055	19,185	21,418
By resource sector - Biomass (jobs)		1,442	1,375	1,308	1,224	1,223	1,220
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		651	458	352	335	319	123
By resource sector - Grid (jobs)		13,388	14,028	21,572	22,621	25,335	30,463
By resource sector - Natural Gas (jobs)		15,382	12,318	12,950	12,615	14,401	14,178
By resource sector - Nuclear (jobs)		1,883	1,369	1,224	1,031	843	587
By resource sector - Oil (jobs)		10,559	9,139	8,128	7,577	7,245	7,010
By resource sector - Solar (jobs)			7,974	8,679	9,069	9,297	20,041
By resource sector - Wind (jobs)		2,354	2,817	5,403	3,657	4,150	6,354
By education level - All sectors - High school diploma or less (jobs)		18,911	20,980	25,375	24,688	26,637	34,025
By education level - All sectors - Associates degree or some college (jobs)		14,218	15,502	18,946	18,562	20,199	25,814
By education level - All sectors - Bachelors degree (jobs)		9,836	10,184	12,002	11,628	12,478	15,706
By education level - All sectors - Masters or professional degree (jobs)		2,376	2,466	2,899	2,856	3,077	3,883
By education level - All sectors - Doctoral degree (jobs)		317	345	394	395	422	547
Related work experience - All sectors - None (jobs)		6,652	7,223	8,726	8,551	9,269	11,796
Related work experience - All sectors - Up to 1 year (jobs)		8,681	9,745	11,773	11,417	12,290	15,925
Related work experience - All sectors - 1 to 4 years (jobs)		16,663	17,881	21,484	20,974	22,664	28,745
Related work experience - All sectors - 4 to 10 years (jobs)		10,813	11,597	13,966	13,654	14,780	18,684
Related work experience - All sectors - Over 10 years (jobs)		2,850	3,032	3,667	3,532	3,810	4,825
On-the-Job Training - All sectors - None (jobs)		2,446	2,686	3,173	3,089	3,311	4,283
On-the-Job Training - All sectors - Up to 1 year (jobs)		30,027	32,338	38,909	37,723	40,670	51,877
On-the-Job Training - All sectors - 1 to 4 years (jobs)		9,676	10,526	12,786	12,562	13,648	17,269
On-the-Job Training - All sectors - 4 to 10 years (jobs)		3,095	3,456	4,181	4,216	4,608	5,795

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		414	472	566	539	576	751
On-Site or In-Plant Training - All sectors - None (jobs)		7,249	7,912	9,493	9,219	9,940	12,790
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		27,320	29,442	35,438	34,405	37,109	47,279
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		7,483	8,154	9,898	9,706	10,532	13,353
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		3,212	3,539	4,255	4,270	4,654	5,825
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		394	431	531	527	578	730
Wage income - All (million $2019)		2,964	3,198	3,879	3,858	4,226	5,371

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	1,162	1,127	1,072	1,042	1,053	1,087	1,129
Final energy use - Residential (PJ)	880	816	779	749	730	718	709
Final energy use - Commercial (PJ)	690	686	690	689	696	725	772
Final energy use - Industry (PJ)	488	516	537	550	569	586	604

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

Item	2020	2025	2030	2035	2040	2045	2050
Electricity distribution capital invested - Cumulative 5-yr (billion $2018)		6.35	6.41	12.1	12.8	14.6	15.5

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 (%)	1.94	19.2	20	21	21.5	22.1	22.9
Sales of space heating units - Electric Resistance (%)	8.69	9.88	9.71	9.54	9.43	8.85	8.05
Sales of space heating units - Gas (%)	64.8	40.9	54.3	61.9	62.2	62.3	62.3
Sales of space heating units - Fossil (%)	24.6	30	16	7.63	6.8	6.76	6.79
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	18.7	35.1	35	35	35	34.9	34.9
Sales of water heating units - Gas Furnace (%)	71.1	58	58.1	58.1	58.1	58.2	58.2
Sales of water heating units - Other (%)	10.3	6.88	6.87	6.87	6.88	6.87	6.87
Sales of cooking units - Electric Resistance (%)	33.8	33.8	33.8	33.8	33.8	33.8	33.8
Sales of cooking units - Gas (%)	66.2	66.2	66.2	66.2	66.2	66.2	66.2
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		13.5	14.1				

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 (%)	0.625	14.7	40.7	61.9	65.1	65.7	65.5
Sales of space heating units - Electric Resistance (%)	2.13	4.03	8.89	21.3	31.8	33.3	33.6
Sales of space heating units - Gas (%)	78.2	65	37.7	11	2.19	0.952	0.86
Sales of space heating units - Fossil (%)	19.1	16.3	12.8	5.74	0.874	0.07	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Electric Heat Pump (%)	0.224	0.326	0.327	0.328	0.329	0.331	0.331
Sales of water heating units - Electric Resistance (%)	1.34	1.93	1.92	1.93	1.93	1.92	1.93
Sales of water heating units - Gas (%)	97	96.4	96.3	96.3	96.3	96.3	96.3
Sales of water heating units - Other (%)	1.45	1.38	1.45	1.44	1.45	1.49	1.49
Sales of cooking units - Electric Resistance (%)	18.5	19.4	19.4	19.6	19.7	19.8	19.9
Sales of cooking units - Gas (%)	81.5	80.6	80.6	80.4	80.3	80.2	80.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		88,595	91,263				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	1,642	1,642	993	993	993	993	0
Installed thermal - Natural gas (MW)	20,926	16,044	15,600	17,565	21,630	27,691	35,070
Installed thermal - Nuclear (MW)	4,410	2,757	2,757	2,143	2,143	1,259	1,259
Installed renewables - Rooftop PV (MW)	2,262	3,350	4,275	5,350	6,543	7,836	9,243
Installed renewables - Solar - Base land use assumptions (MW)	692	692	692	692	692	692	692
Installed renewables - Wind - Base land use assumptions (MW)	3,274	3,274	3,274	4,239	5,070	5,858	5,858
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	675	2,100	4,641	5,528	5,828	7,073
Installed renewables - Solar - Constrained land use assumptions (MW)	21.3	21.3	21.3	21.3	21.3	21.3	21.3
Installed renewables - Wind - Constrained land use assumptions (MW)	9.6	9.6	9.6	54.6	54.6	54.6	54.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,394	1,394	1,394	1,394	1,394	1,394	1,394
Wind - Base land use assumptions (GWh)	14,244	14,244	14,244	17,903	20,983	23,892	23,892
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)	-10.2		-16.4				-14.7
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.49		-2.67				-2.78
Business-as-usual carbon sink - Total (Mt CO2e/y)	-11.7		-19.1				-17.5

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)							-192
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-459
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-4,555
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-307

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-1,821
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-375
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-136
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-418
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,184
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-9,448
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-287
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,605
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-8,206
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-450
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-3,642
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-724
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-205
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-2,967
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-2,349
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-20,436
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-383
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-2,752
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-11,858
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-604
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-5,464
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,072
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-273
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-5,516
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-31,435
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-3,513
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							31.3
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							350
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,317

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							111
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)							53.6
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.02
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							27.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							705
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							3,603
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							47
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							361
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,182
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							167
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)							77.7
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							13.5
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							196
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							1,419
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							6,464
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							62.6
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							373
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,047
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							223
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							18
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							157
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,164
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							8,146