Net-Zero America - California data

October 29, 2021 (updated January 9, 2022)

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Coal (deaths)		28.3	0.037	0.037	0.019	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		242	136	122	105	59.2	26.4
Premature deaths from air pollution - Mobile - On-Road (deaths)		3,541	3,341	2,565	1,495	676	251
Premature deaths from air pollution - Gas Stations (deaths)		32	29.5	22.3	13.1	6.11	2.58
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		543	415	247	120	47.5	15.5
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		9.71	8.33	7.04	5.75	4.47	3.2
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		24.5	20.8	15.6	11.3	8.12	6.09
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.8	1.76	1.72	1.67	1.61	1.53
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		249	221	160	99.6	59.5	34.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		46.9	38.1	30.8	24	17.6	11.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		84.2	71.2	58.8	46.5	34.4	22.7
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.443	0.059	0.055	0.05	0.047	0.046
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		163	156	145	116	87.5	55.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		251	0.33	0.328	0.173	0.099	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		2,148	1,204	1,078	930	524	234
Monetary damages from air pollution - Mobile - On-Road (million $2019)		31,487	29,710	22,808	13,295	6,015	2,235
Monetary damages from air pollution - Gas Stations (million $2019)		283	261	197	116	54.1	22.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,813	3,676	2,191	1,060	421	137
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		86.1	73.9	62.4	51	39.6	28.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		217	184	139	101	71.9	53.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		15.9	15.6	15.2	14.8	14.2	13.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		2,201	1,956	1,412	881	527	303

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)		415	337	272	212	156	103
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		745	630	520	411	304	201
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		3.91	0.519	0.488	0.44	0.414	0.404
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,449	1,390	1,289	1,028	777	490

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		807	1,391	1,956	1,911	1,642	1,347
By economic sector - Construction (jobs)		60,036	68,964	86,441	101,662	113,325	148,016
By economic sector - Manufacturing (jobs)		30,232	36,465	40,895	37,308	33,498	34,813
By economic sector - Mining (jobs)		32,912	26,356	20,984	13,552	9,002	5,320
By economic sector - Other (jobs)		8,218	10,008	13,792	18,233	22,670	34,683
By economic sector - Pipeline (jobs)		2,738	3,005	2,338	1,855	1,425	1,184
By economic sector - Professional (jobs)		29,060	33,837	44,279	53,147	61,559	81,381
By economic sector - Trade (jobs)		24,188	25,606	30,569	35,225	40,610	55,366
By economic sector - Utilities (jobs)		31,587	38,837	55,611	67,533	76,602	95,500
By resource sector - Biomass (jobs)		2,736	3,655	5,346	5,622	6,006	5,813
By resource sector - CO2 (jobs)		127	5,222	3,730	3,209	3,425	4,510
By resource sector - Coal (jobs)		21.8	7.3	0	0	0	0
By resource sector - Grid (jobs)		42,372	57,258	93,660	117,892	137,108	176,247
By resource sector - Natural Gas (jobs)		24,459	18,978	17,499	16,093	13,996	11,710
By resource sector - Nuclear (jobs)		691	0	0	0	0	0
By resource sector - Oil (jobs)		74,368	64,969	55,609	40,007	29,393	18,443
By resource sector - Solar (jobs)		61,168	67,821	86,157	105,706	123,569	184,667
By resource sector - Wind (jobs)		13,834	26,559	34,864	41,897	46,836	56,220
By education level - All sectors - High school diploma or less (jobs)		91,439	102,542	124,841	138,968	150,964	191,434
By education level - All sectors - Associates degree or some college (jobs)		66,541	75,202	92,749	104,773	115,263	147,701
By education level - All sectors - Bachelors degree (jobs)		48,332	52,148	61,734	67,204	72,676	91,195
By education level - All sectors - Masters or professional degree (jobs)		11,715	12,682	15,249	16,899	18,554	23,575
By education level - All sectors - Doctoral degree (jobs)		1,750	1,895	2,292	2,582	2,876	3,704
Related work experience - All sectors - None (jobs)		31,071	34,828	42,623	47,808	52,373	66,865
Related work experience - All sectors - Up to 1 year (jobs)		43,283	48,587	59,328	66,347	72,431	92,574
Related work experience - All sectors - 1 to 4 years (jobs)		80,229	88,797	107,437	119,171	129,796	164,426
Related work experience - All sectors - 4 to 10 years (jobs)		51,394	57,034	69,198	77,054	84,082	106,567
Related work experience - All sectors - Over 10 years (jobs)		13,800	15,222	18,279	20,046	21,649	27,179
On-the-Job Training - All sectors - None (jobs)		12,406	13,576	16,307	18,137	19,853	25,486
On-the-Job Training - All sectors - Up to 1 year (jobs)		145,590	161,449	195,145	215,747	234,378	296,619

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)		45,454	50,958	62,435	70,165	76,857	97,859
On-the-Job Training - All sectors - 4 to 10 years (jobs)		14,112	16,031	20,066	23,191	25,826	33,332
On-the-Job Training - All sectors - Over 10 years (jobs)		2,215	2,454	2,912	3,187	3,419	4,313
On-Site or In-Plant Training - All sectors - None (jobs)		35,764	39,741	48,180	53,709	58,685	74,885
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		132,025	146,402	177,081	195,976	213,024	269,739
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		35,487	39,728	48,564	54,418	59,503	75,683
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		14,749	16,582	20,511	23,428	25,918	33,204
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		1,753	2,016	2,529	2,894	3,201	4,099
Wage income - All (million $2019)		14,114	15,810	19,448	21,911	24,219	31,022

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		546	474	371	277	202	142
Oil consumption - Cumulative (million bbls)							11,511
Oil production - Annual (million bbls)		222	223	223	177	143	95.5
Natural gas consumption - Annual (tcf)		1,654	1,394	1,118	842	530	367
Natural gas consumption - Cumulative (tcf)							33,681
Natural gas production - Annual (tcf)		236	223	194	164	130	101

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	3,056	2,945	2,657	2,291	1,958	1,742	1,635
Final energy use - Residential (PJ)	878	820	708	579	478	418	385
Final energy use - Commercial (PJ)	793	798	775	732	700	692	702
Final energy use - Industry (PJ)	1,021	1,057	1,074	1,125	1,184	1,218	1,259

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)		12.6	13	29.3	31.6	24.6	25.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2,562	4,931	7,300	15,592	23,885	30,512	37,138
Vehicle stocks - LDV – All others (1000 units)	30,967	29,487	28,006	20,409	12,812	7,249	1,685
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		5,550	15,540	23,053	35,766	38,007	36,736
Public EV charging plugs - DC Fast (1000 units)	4.35		11.9		38.9		60.4
Public EV charging plugs - L2 (1000 units)	21.5		285		934		1,452

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 (%)	5.99	23.4	70.8	81.7	82.3	82.2	82.2
Sales of space heating units - Electric Resistance (%)	16.4	23.7	15.2	13.3	13.2	13.3	13.4
Sales of space heating units - Gas (%)	74.3	47	10.3	1.95	1.53	1.52	1.52
Sales of space heating units - Fossil (%)	3.33	5.85	3.58	3.05	3	2.95	2.91
Sales of water heating units - Electric Heat Pump (%)	0	11.2	59.4	70.3	70.8	70.8	70.8
Sales of water heating units - Electric Resistance (%)	17.5	31.3	27.2	26.4	26.4	26.4	26.4
Sales of water heating units - Gas Furnace (%)	79.8	54.8	10.6	0.486	0.003	0	0
Sales of water heating units - Other (%)	2.7	2.75	2.76	2.79	2.8	2.82	2.83
Sales of cooking units - Electric Resistance (%)	40	52.8	91.9	99.6	100	100	100
Sales of cooking units - Gas (%)	60	47.2	8.07	0.406	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		27.7	36.5				

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 (%)	1.74	20.9	62.9	75.6	76.7	76.7	76.7
Sales of space heating units - Electric Resistance (%)	11.4	14.3	19.6	22.2	22.6	22.6	22.6
Sales of space heating units - Gas Furnace (%)	86.9	64.8	17.5	2.29	0.731	0.685	0.683
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.63	11.5	57.5	68	68.5	68.5	68.5
Sales of water heating units - Electric Resistance (%)	2.03	6.87	26.2	30.7	30.9	30.9	30.9
Sales of water heating units - Gas Furnace (%)	96.8	81	15.7	0.718	0.005	0	0
Sales of water heating units - Other (%)	0.501	0.619	0.623	0.624	0.623	0.624	0.625
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		120,478	131,958				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	55	55	0	0	0	0	0
Installed thermal - Natural gas (MW)	36,459	32,156	39,229	50,374	55,658	51,069	57,596
Installed thermal - Nuclear (MW)	2,323	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	10,012	15,483	20,658	26,842	34,107	42,472	52,234
Installed renewables - Solar - Base land use assumptions (MW)	26,881	29,945	38,698	56,616	84,697	124,004	167,110
Installed renewables - Wind - Base land use assumptions (MW)	7,083	7,083	7,083	7,083	7,123	7,193	7,193
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	0	282
Installed renewables - Solar - Constrained land use assumptions (MW)	26,752	28,404	35,769	54,798	90,317	121,013	166,122
Installed renewables - Wind - Constrained land use assumptions (MW)	7,217	7,252	7,252	7,903	8,613	8,866	9,415

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	2,768
Capital invested - Solar PV - Base (billion $2018)		4.1	10.5	19.8	29.2	38.6	39.9
Capital invested - Wind - Base (billion $2018)		0	0	0	0.06	0.103	0
Capital invested - Offshore Wind - Base (billion $2018)		0.292	0	0	0.987	1.09	7.32
Capital invested - Solar PV - Constrained (billion $2018)		13.6	9.2	26.8	27.8	30.2	38.8
Capital invested - Wind - Constrained (billion $2018)		0.068	0	0.657	1.24	0.43	0.3
Capital invested - Offshore Wind - Constrained (billion $2018)		0.153	0	0.119	0.769	1.26	6.35
Capital invested - Biomass power plant (billion $2018)	0	0.007	0.811	0	0.169	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0.073	0.003	0.003	0.022
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0.556	0.001	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	66,975	74,628	96,427	139,989	204,029	291,499	388,310
Wind - Base land use assumptions (GWh)	28,124	28,124	28,124	28,124	28,259	28,498	28,498
OffshoreWind - Base land use assumptions (GWh)	0	418	418	418	3,109	6,763	37,067
Solar - Constrained land use assumptions (GWh)	64,339	68,428	86,888	131,184	210,139	277,511	377,239
Wind - Constrained land use assumptions (GWh)	28,240	28,364	28,364	30,135	31,893	32,448	33,570
OffshoreWind - Constrained land use assumptions (GWh)	0	418	418	418	3,109	6,763	37,067
Biomass power plant (GWh)	0	13.5	1,606	1,606	1,952	1,952	1,952
Biomass w/ccu power plant (GWh)	0	0	624	625	625	625	625
Biomass w/ccu allam power plant (GWh)	0	0	0	72.5	75.5	78.9	101

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	2	2	2
Number of facilities - Power ccu (quantity)	0	0	4	6	6	6	6
Number of facilities - Allam power w ccu (quantity)	0	0	0	4	5	6	7
Number of facilities - Beccs hydrogen (quantity)	0	0	0	8	14	18	21
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	4	6	7	8
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	4	6	7	8
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	4	4	4	4	4
Conversion capital investment - Cumulative 5-yr (million $2018)		7.67	1,415	7,867	3,886	3,650	2,020
Biomass purchases (million $2018/y)		8.07	113	386	525	652	722

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0.75	26.1	37.5	49.8	57.6
Annual - BECCS (MMT)		0	0.62	10.6	15.3	20	22.5
Annual - NGCC (MMT)		0	0.13	8.85	12.3	16.2	21
Annual - Cement and lime (MMT)		0	0	6.71	9.95	13.7	14.1
Cumulative - All (MMT)		0	0.75	26.9	64.4	114	172
Cumulative - BECCS (MMT)		0	0.62	11.2	26.5	46.5	69
Cumulative - NGCC (MMT)		0	0.13	8.98	21.3	37.4	58.4
Cumulative - Cement and lime (MMT)		0	0	6.71	16.7	30.4	44.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	1,285	1,529	1,529	1,529	1,529
Spur (km)		0	798	3,159	4,463	5,023	6,219
All (km)		0	2,083	4,688	5,992	6,553	7,748
Cumulative investment - Trunk (million $2018)		0	4,920	5,686	5,686	5,686	5,686
Cumulative investment - Spur (million $2018)		0	423	2,013	2,845	3,310	4,083
Cumulative investment - All (million $2018)		0	5,343	7,698	8,531	8,996	9,769

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	28.2	41.6	53.4	80.1
Injection wells (wells)		0	0	62	92	122	174
Resource characterization, appraisal, permitting costs (million $2020)		250	900	1,370	1,370	1,370	1,370
Wells and facilities construction costs (million $2020)		0	0	1,860	2,760	3,660	5,220

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)							-1,878
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-876
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-5,203
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-661
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,189
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-708
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-144
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-210
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,642
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,511
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,813
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-3,065

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)							-9,374
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-968
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,379
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,365
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-216
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,240
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,914
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,748
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-5,255
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-13,545
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,299
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,568
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,022
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-288
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,778
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,341
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,838
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							307
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							668
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,646
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							239
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)							101
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.51
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							13.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,572

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)							5,556
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							460
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							690
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,777
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							360
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)							147
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							98.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,166
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,712
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							613
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							711
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,907
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							479
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)							192
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							78.9
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,598
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,598

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)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,030
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-23.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,054
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,034
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-47.2
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,082
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,925
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							36.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,962
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,813
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							73.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,887

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)		28.3	0.037	0.037	0.019	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		230	114	66.3	25.6	7.98	3.54
Premature deaths from air pollution - Mobile - On-Road (deaths)		3,611	3,710	3,661	3,339	2,685	1,852
Premature deaths from air pollution - Gas Stations (deaths)		32.8	33.5	32.8	29.6	23.6	16.3

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)		551	504	443	350	236	137
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		10.1	9.19	8.33	7.47	6.61	5.74
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		24.9	24.5	23.8	21.4	17.3	13.4
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.8	1.76	1.72	1.67	1.61	1.53
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		252	261	257	231	185	136
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		46.9	40.8	36.1	31.7	27.5	23.5
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		84.2	76.3	68.9	61.4	53.8	46.2
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.418	0.06	0.059	0.056	0.048	0.032
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		163	151	133	119	107	76.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		251	0.33	0.328	0.173	0.099	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		2,037	1,010	587	227	70.7	31.3
Monetary damages from air pollution - Mobile - On-Road (million $2019)		32,107	32,984	32,552	29,690	23,875	16,465
Monetary damages from air pollution - Gas Stations (million $2019)		290	297	290	262	209	144
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,884	4,464	3,926	3,099	2,095	1,217
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		89.9	81.4	73.8	66.2	58.5	50.9
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		221	217	211	189	154	119
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		15.9	15.6	15.2	14.8	14.2	13.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		2,227	2,308	2,274	2,046	1,642	1,200
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		415	362	319	281	244	208
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		745	675	610	544	476	409
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		3.69	0.528	0.521	0.498	0.419	0.285

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)		1,445	1,337	1,182	1,054	950	680

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		902	1,617	2,963	3,003	2,178	1,348
By economic sector - Construction (jobs)		59,956	70,379	80,330	95,314	119,572	155,974
By economic sector - Manufacturing (jobs)		30,478	37,139	38,601	38,871	41,887	41,411
By economic sector - Mining (jobs)		32,995	26,633	22,064	16,996	13,182	8,051
By economic sector - Other (jobs)		8,277	10,139	12,821	16,954	23,550	35,477
By economic sector - Pipeline (jobs)		2,748	3,407	2,626	2,367	2,142	1,872
By economic sector - Professional (jobs)		29,039	34,108	42,940	53,278	66,868	87,484
By economic sector - Trade (jobs)		24,231	25,954	29,919	35,550	44,540	59,454
By economic sector - Utilities (jobs)		30,349	38,523	47,429	58,362	77,362	99,505
By resource sector - Biomass (jobs)		2,879	4,195	9,441	12,266	9,274	5,624
By resource sector - CO2 (jobs)		127	8,845	6,375	5,521	5,872	7,709
By resource sector - Coal (jobs)		21.8	7.3	0	0	0	0
By resource sector - Grid (jobs)		39,934	54,317	77,371	99,210	138,144	183,137
By resource sector - Natural Gas (jobs)		24,228	17,293	14,245	13,323	12,256	10,005
By resource sector - Nuclear (jobs)		691	0	0	0	0	0
By resource sector - Oil (jobs)		74,636	66,277	59,015	51,302	43,659	27,899
By resource sector - Solar (jobs)		62,129	69,294	80,148	98,327	128,898	185,809
By resource sector - Wind (jobs)		14,328	27,670	33,097	40,747	53,176	70,393
By education level - All sectors - High school diploma or less (jobs)		91,158	104,174	117,693	134,625	163,780	204,716
By education level - All sectors - Associates degree or some college (jobs)		66,209	76,219	86,447	100,216	124,083	157,774
By education level - All sectors - Bachelors degree (jobs)		48,184	52,776	58,791	66,539	79,959	98,658
By education level - All sectors - Masters or professional degree (jobs)		11,674	12,812	14,537	16,709	20,295	25,426
By education level - All sectors - Doctoral degree (jobs)		1,749	1,917	2,225	2,605	3,163	4,003
Related work experience - All sectors - None (jobs)		30,942	35,342	40,108	46,232	56,665	71,457
Related work experience - All sectors - Up to 1 year (jobs)		43,194	49,353	56,113	64,534	78,645	98,926
Related work experience - All sectors - 1 to 4 years (jobs)		79,922	89,993	101,309	115,881	141,162	176,527
Related work experience - All sectors - 4 to 10 years (jobs)		51,170	57,797	64,986	74,561	91,175	114,374
Related work experience - All sectors - Over 10 years (jobs)		13,746	15,413	17,176	19,486	23,633	29,293
On-the-Job Training - All sectors - None (jobs)		12,382	13,775	15,490	17,768	21,624	27,287
On-the-Job Training - All sectors - Up to 1 year (jobs)		145,138	163,711	184,646	210,821	255,737	318,628
On-the-Job Training - All sectors - 1 to 4 years (jobs)		45,220	51,652	58,215	67,120	82,752	104,634
On-the-Job Training - All sectors - 4 to 10 years (jobs)		14,019	16,263	18,598	21,887	27,433	35,389
On-the-Job Training - All sectors - Over 10 years (jobs)		2,215	2,497	2,745	3,098	3,735	4,639
On-Site or In-Plant Training - All sectors - None (jobs)		35,674	40,329	45,546	52,294	63,774	80,268
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		131,584	148,434	167,340	191,165	232,190	289,605

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)		35,316	40,273	45,366	52,201	64,196	80,963
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		14,659	16,820	19,097	22,287	27,693	35,371
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		1,740	2,043	2,344	2,748	3,427	4,371
Wage income - All (million $2019)		14,044	16,009	18,299	21,242	26,267	33,291

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	3,060	2,970	2,767	2,590	2,445	2,267	2,054
Final energy use - Residential (PJ)	878	825	766	706	626	537	459
Final energy use - Commercial (PJ)	793	800	806	802	788	770	759
Final energy use - Industry (PJ)	1,021	1,058	1,081	1,146	1,217	1,253	1,293

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)		9.31	9.32	16.2	17	25.6	27.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	1,983	2,669	3,356	6,535	9,714	16,751	23,787
Vehicle stocks - LDV – All others (1000 units)	31,093	31,093	31,093	29,494	27,894	21,495	15,096
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	1,128	1,859	6,771	19,756	29,318
Public EV charging plugs - DC Fast (1000 units)	4.35		5.46		15.8		38.7
Public EV charging plugs - L2 (1000 units)	21.5		131		380		930

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 (%)	5.99	14.3	19.7	35.3	59.2	74.8	80.3
Sales of space heating units - Electric Resistance (%)	16.4	25.3	24.3	21.5	17.3	14.5	13.6
Sales of space heating units - Gas (%)	74.3	54.1	50	38	19.4	7.29	3.04
Sales of space heating units - Fossil (%)	3.33	6.29	6.05	5.3	4.13	3.36	3.07
Sales of water heating units - Electric Heat Pump (%)	0	1.93	7.42	23.2	47.5	63.3	68.9
Sales of water heating units - Electric Resistance (%)	17.5	32.1	31.6	30.2	28.2	26.9	26.5
Sales of water heating units - Gas Furnace (%)	79.8	63.2	58.2	43.8	21.5	6.93	1.83
Sales of water heating units - Other (%)	2.7	2.75	2.76	2.78	2.8	2.81	2.83
Sales of cooking units - Electric Resistance (%)	39.8	41.4	46.9	61.4	81.6	94.1	98.4
Sales of cooking units - Gas (%)	60.2	58.6	53.1	38.6	18.4	5.94	1.6
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		27.5	36.2				

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 (%)	1.74	13	17.8	31.6	53.4	68.7	74.5
Sales of space heating units - Electric Resistance (%)	11.4	13.3	14	15.8	18.8	21.2	22.2
Sales of space heating units - Gas Furnace (%)	86.9	73.7	68.3	52.6	27.8	10.2	3.31
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.63	2.65	7.89	23	46.1	61.3	66.6
Sales of water heating units - Electric Resistance (%)	2.03	3.16	5.36	11.7	21.4	27.8	30.1
Sales of water heating units - Gas Furnace (%)	96.8	93.6	86.1	64.7	31.8	10.2	2.7
Sales of water heating units - Other (%)	0.501	0.619	0.623	0.624	0.623	0.624	0.625
Sales of cooking units - Electric Resistance (%)	27.5	31	36.1	49.7	68.6	80.2	84.3
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		120,137	130,140				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	55	55	0	0	0	0	0
Installed thermal - Natural gas (MW)	36,464	30,969	35,119	38,381	38,198	29,008	32,522
Installed thermal - Nuclear (MW)	2,323	0	0	0	0	0	0

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)							-1,878
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-876
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-5,203
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-661
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,189
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-708
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-144
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-210
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,642
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,511
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,813
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-3,065
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-9,374
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-968
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,379

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,365
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-216
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,240
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,914
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,748
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-5,255
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-13,545
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,299
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,568
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,022
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-288
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,778
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,341
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,838
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							307
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							668
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,646
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							239
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)							101
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.51
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							13.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,572
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,556
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							460

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)							690
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,777
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							360
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)							147
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							98.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,166
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,712
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							613
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							711
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,907
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							479
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)							192
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							78.9
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,598
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,598

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)							0

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)							-2,030
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-23.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,054
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,034
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-47.2
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,082
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,925
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							36.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,962
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,813
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							73.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,887

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)		28.3	0.037	0.037	0.019	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		169	128	65.5	36.1	13.7	2.89
Premature deaths from air pollution - Mobile - On-Road (deaths)		3,541	3,341	2,565	1,495	676	251
Premature deaths from air pollution - Gas Stations (deaths)		32	29.5	22.3	13.1	6.11	2.58
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		543	415	247	120	47.5	15.5
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		9.71	8.33	7.04	5.75	4.47	3.2

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)		24.5	20.8	15.6	11.3	8.12	6.09
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.8	1.76	1.72	1.67	1.61	1.53
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		249	221	160	99.6	59.5	34.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		46.9	38.1	30.8	24	17.6	11.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		84.2	71.2	58.8	46.5	34.4	22.7
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.507	0.059	0.055	0.049	0.046	0.016
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		160	154	136	99.8	62.1	9.23
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		251	0.33	0.328	0.173	0.099	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		1,498	1,137	581	320	121	25.6
Monetary damages from air pollution - Mobile - On-Road (million $2019)		31,487	29,710	22,808	13,295	6,015	2,235
Monetary damages from air pollution - Gas Stations (million $2019)		283	261	197	116	54.1	22.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,813	3,676	2,191	1,060	421	137
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		86.1	73.9	62.4	51	39.6	28.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		217	184	139	101	71.9	53.9
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		15.9	15.6	15.2	14.8	14.2	13.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		2,201	1,956	1,412	881	527	303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		415	337	272	212	156	103
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		745	630	520	411	304	201
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		4.48	0.519	0.484	0.434	0.408	0.139
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,423	1,369	1,204	886	551	81.9

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		810	1,280	1,847	1,749	1,412	1,335
By economic sector - Construction (jobs)		66,969	72,326	96,611	123,078	140,579	190,328
By economic sector - Manufacturing (jobs)		33,036	39,159	47,493	47,343	44,020	64,511
By economic sector - Mining (jobs)		32,721	26,008	19,646	11,947	6,655	1,109
By economic sector - Other (jobs)		9,569	10,969	15,991	23,053	28,250	42,055
By economic sector - Pipeline (jobs)		2,684	2,325	1,778	1,212	735	218
By economic sector - Professional (jobs)		31,462	36,158	49,959	65,495	79,021	109,419
By economic sector - Trade (jobs)		25,705	26,939	33,745	42,454	50,536	70,833
By economic sector - Utilities (jobs)		32,991	39,213	59,458	76,688	93,743	133,229
By resource sector - Biomass (jobs)		2,572	3,406	4,803	5,529	5,260	5,937
By resource sector - CO2 (jobs)		0	0.001	0	0.001	0.001	0
By resource sector - Coal (jobs)		21.8	7.3	0	0	0	0
By resource sector - Grid (jobs)		45,696	62,992	105,038	141,134	175,369	255,865
By resource sector - Natural Gas (jobs)		23,482	18,372	15,203	11,947	10,814	9,720
By resource sector - Nuclear (jobs)		691	0	0	0	0	0
By resource sector - Oil (jobs)		74,372	64,720	54,027	36,359	22,491	3,688
By resource sector - Solar (jobs)		73,298	75,861	99,601	134,726	151,650	217,267
By resource sector - Wind (jobs)		15,815	29,019	47,855	63,323	79,365	120,559
By education level - All sectors - High school diploma or less (jobs)		98,640	106,725	137,434	165,247	185,784	255,719
By education level - All sectors - Associates degree or some college (jobs)		71,755	78,289	102,380	125,101	143,021	198,856
By education level - All sectors - Bachelors degree (jobs)		51,265	54,172	67,489	79,506	89,561	122,130
By education level - All sectors - Masters or professional degree (jobs)		12,423	13,203	16,694	20,058	22,984	31,447
By education level - All sectors - Doctoral degree (jobs)		1,865	1,989	2,530	3,107	3,600	4,885
Related work experience - All sectors - None (jobs)		33,401	36,187	46,833	56,767	64,518	89,180
Related work experience - All sectors - Up to 1 year (jobs)		46,830	50,809	65,695	79,557	89,803	124,313
Related work experience - All sectors - 1 to 4 years (jobs)		85,882	92,290	117,886	141,325	159,923	219,713
Related work experience - All sectors - 4 to 10 years (jobs)		55,075	59,255	76,017	91,535	103,922	142,971
Related work experience - All sectors - Over 10 years (jobs)		14,760	15,837	20,096	23,834	26,785	36,859
On-the-Job Training - All sectors - None (jobs)		13,329	14,169	17,976	21,680	24,542	33,813
On-the-Job Training - All sectors - Up to 1 year (jobs)		156,040	168,126	214,605	256,562	289,248	398,299
On-the-Job Training - All sectors - 1 to 4 years (jobs)		48,907	52,915	68,665	83,397	95,011	131,144
On-the-Job Training - All sectors - 4 to 10 years (jobs)		15,272	16,606	22,050	27,544	31,904	43,957
On-the-Job Training - All sectors - Over 10 years (jobs)		2,401	2,562	3,232	3,834	4,246	5,824
On-Site or In-Plant Training - All sectors - None (jobs)		38,476	41,446	53,191	64,236	72,802	100,563
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		141,515	152,411	194,677	232,946	262,788	361,877
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		38,173	41,274	53,403	64,663	73,477	101,339
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		15,891	17,154	22,470	27,730	31,915	43,748
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		1,893	2,093	2,786	3,443	3,967	5,509
Wage income - All (million $2019)		15,076	16,397	21,270	25,877	29,786	41,365

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	3,056	2,945	2,657	2,291	1,958	1,742	1,635
Final energy use - Residential (PJ)	878	820	708	579	478	418	385
Final energy use - Commercial (PJ)	793	798	775	732	700	692	702
Final energy use - Industry (PJ)	1,021	1,057	1,074	1,125	1,184	1,218	1,259

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)		12.6	13	29.3	31.6	24.6	25.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2,562	4,931	7,300	15,592	23,885	30,512	37,138
Vehicle stocks - LDV – All others (1000 units)	30,967	29,487	28,006	20,409	12,812	7,249	1,685
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		5,550	15,540	23,053	35,766	38,007	36,736
Public EV charging plugs - DC Fast (1000 units)	4.35		11.9		38.9		60.4
Public EV charging plugs - L2 (1000 units)	21.5		285		934		1,452

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 (%)	5.99	23.4	70.8	81.7	82.3	82.2	82.2
Sales of space heating units - Electric Resistance (%)	16.4	23.7	15.2	13.3	13.2	13.3	13.4
Sales of space heating units - Gas (%)	74.3	47	10.3	1.95	1.53	1.52	1.52
Sales of space heating units - Fossil (%)	3.33	5.85	3.58	3.05	3	2.95	2.91
Sales of water heating units - Electric Heat Pump (%)	0	11.2	59.4	70.3	70.8	70.8	70.8
Sales of water heating units - Electric Resistance (%)	17.5	31.3	27.2	26.4	26.4	26.4	26.4
Sales of water heating units - Gas Furnace (%)	79.8	54.8	10.6	0.486	0.003	0	0
Sales of water heating units - Other (%)	2.7	2.75	2.76	2.79	2.8	2.82	2.83
Sales of cooking units - Electric Resistance (%)	40	52.8	91.9	99.6	100	100	100
Sales of cooking units - Gas (%)	60	47.2	8.07	0.406	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		27.7	36.5				

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 (%)	1.74	20.9	62.9	75.6	76.7	76.7	76.7
Sales of space heating units - Electric Resistance (%)	11.4	14.3	19.6	22.2	22.6	22.6	22.6
Sales of space heating units - Gas Furnace (%)	86.9	64.8	17.5	2.29	0.731	0.685	0.683
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.63	11.5	57.5	68	68.5	68.5	68.5
Sales of water heating units - Electric Resistance (%)	2.03	6.87	26.2	30.7	30.9	30.9	30.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	96.8	81	15.7	0.718	0.005	0	0
Sales of water heating units - Other (%)	0.501	0.619	0.623	0.624	0.623	0.624	0.625
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		120,478	131,958				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	55	55	0	0	0	0	0
Installed thermal - Natural gas (MW)	36,464	30,382	39,336	48,811	45,329	39,735	50,598
Installed thermal - Nuclear (MW)	2,323	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	10,012	15,483	20,658	26,842	34,107	42,472	52,234
Installed renewables - Solar - Base land use assumptions (MW)	26,881	37,103	48,315	74,256	119,346	164,761	227,819
Installed renewables - Wind - Base land use assumptions (MW)	7,083	7,083	7,083	7,123	7,279	7,385	7,465
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	0	0	0	0	376	10,563
Installed renewables - Solar - Constrained land use assumptions (MW)	26,884	34,186	46,320	71,300	124,405	172,545	227,372
Installed renewables - Wind - Constrained land use assumptions (MW)	8,023	8,058	8,111	9,235	10,094	11,169	13,961
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	39.9	39.9	87.6	898	6,264	17,413
Capital invested - Solar PV - Base (billion $2018)		13.7	13.4	28.6	46.9	44.6	58.4
Capital invested - Wind - Base (billion $2018)		0	0	0.063	0.24	0.154	0.11
Capital invested - Offshore Wind - Base (billion $2018)		0.292	0	0	1.57	9.82	13.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	66,975	92,334	119,520	180,379	282,184	383,350	523,234
Wind - Base land use assumptions (GWh)	28,124	28,124	28,124	28,259	28,777	29,112	29,351
OffshoreWind - Base land use assumptions (GWh)	0	418	418	418	4,696	37,533	86,533
Solar - Constrained land use assumptions (GWh)	133,950	170,119	229,275	341,268	574,837	786,552	1,025,722
Wind - Constrained land use assumptions (GWh)	56,479	56,727	57,022	62,932	66,635	70,629	82,299
OffshoreWind - Constrained land use assumptions (GWh)	0	438	438	953	9,850	64,792	175,138

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)							-1,878
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-876
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-5,203
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-661

Table 36: *E+RE+ 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)							-2,189
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-708
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-144
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-210
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,642
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,511
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,813
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-3,065
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-9,374
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-968
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,379
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,365
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-216
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,240
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,914
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,748
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-5,255
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-13,545
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,299
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,568
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,022
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-288
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,778
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,341
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,838
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							307
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							668
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,646

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)							239
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)							101
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.51
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							13.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,572
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,556
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							460
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							690
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,777
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							360
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)							147
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							98.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,166
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,712
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							613
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							711
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,907
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							479
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)							192
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							78.9
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,598
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,598

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)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,030
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-23.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,054
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,034
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-47.2
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,082
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,925
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							36.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,962
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,813
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							73.8

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)							3,887

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)		28.3	0.037	0.037	0.019	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		237	76.6	116	152	76.1	19.5
Premature deaths from air pollution - Mobile - On-Road (deaths)		3,541	3,341	2,565	1,495	676	251
Premature deaths from air pollution - Gas Stations (deaths)		32	29.5	22.3	13.1	6.11	2.58
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		543	415	247	120	47.5	15.5
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		9.71	8.33	7.04	5.75	4.47	3.2
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		24.5	20.8	15.6	11.3	8.12	6.09
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.8	1.76	1.72	1.67	1.61	1.53
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		249	221	160	99.6	59.5	34.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		46.9	38.1	30.8	24	17.6	11.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		84.2	71.2	58.8	46.5	34.4	22.7
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.379	0.058	0.055	0.049	0.047	0.016
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		165	163	163	142	121	91.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		251	0.33	0.328	0.173	0.099	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		2,098	678	1,028	1,343	674	172
Monetary damages from air pollution - Mobile - On-Road (million $2019)		31,487	29,710	22,808	13,295	6,015	2,235
Monetary damages from air pollution - Gas Stations (million $2019)		283	261	197	116	54.1	22.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,813	3,676	2,191	1,060	421	137
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		86.1	73.9	62.4	51	39.6	28.4
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		217	184	139	101	71.9	53.9

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)		15.9	15.6	15.2	14.8	14.2	13.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		2,201	1,956	1,412	881	527	303
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		415	337	272	212	156	103
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		745	630	520	411	304	201
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		3.35	0.514	0.486	0.437	0.414	0.138
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,467	1,450	1,452	1,259	1,073	813

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		870	1,695	2,977	2,509	1,811	1,357
By economic sector - Construction (jobs)		61,667	62,610	68,859	75,854	75,839	105,388
By economic sector - Manufacturing (jobs)		31,658	31,239	34,963	31,388	24,826	25,340
By economic sector - Mining (jobs)		33,026	26,637	21,930	14,299	9,962	6,732
By economic sector - Other (jobs)		8,666	8,856	10,702	13,443	14,750	25,985
By economic sector - Pipeline (jobs)		2,793	3,675	2,935	2,560	2,220	2,089
By economic sector - Professional (jobs)		29,133	29,552	35,558	39,206	40,191	54,900
By economic sector - Trade (jobs)		24,385	23,287	25,344	26,812	27,333	39,133
By economic sector - Utilities (jobs)		30,323	34,387	43,113	48,546	51,253	62,031
By resource sector - Biomass (jobs)		2,611	4,237	9,772	9,105	7,104	5,700
By resource sector - CO2 (jobs)		127	9,991	7,210	6,227	6,620	8,704
By resource sector - Coal (jobs)		21.8	7.3	0	0	0	0
By resource sector - Grid (jobs)		40,575	45,408	68,407	79,715	82,542	103,230
By resource sector - Natural Gas (jobs)		23,896	18,226	16,839	15,891	17,294	15,940
By resource sector - Nuclear (jobs)		691	0	0	0	0	0
By resource sector - Oil (jobs)		74,364	64,969	55,609	40,006	30,168	20,957
By resource sector - Solar (jobs)		67,740	62,039	67,980	80,528	81,953	146,370
By resource sector - Wind (jobs)		12,493	17,061	20,562	23,144	22,505	22,055
By education level - All sectors - High school diploma or less (jobs)		92,881	93,284	103,997	107,623	104,327	135,886
By education level - All sectors - Associates degree or some college (jobs)		67,376	67,933	75,924	79,810	78,731	103,841
By education level - All sectors - Bachelors degree (jobs)		48,721	47,496	51,826	52,211	50,443	64,207
By education level - All sectors - Masters or professional degree (jobs)		11,780	11,513	12,725	12,996	12,733	16,442
By education level - All sectors - Doctoral degree (jobs)		1,762	1,712	1,908	1,976	1,953	2,580
Related work experience - All sectors - None (jobs)		31,457	31,668	35,388	36,857	36,114	47,335
Related work experience - All sectors - Up to 1 year (jobs)		44,022	43,953	49,255	51,199	49,666	65,462
Related work experience - All sectors - 1 to 4 years (jobs)		81,132	80,755	89,365	91,954	89,611	116,072
Related work experience - All sectors - 4 to 10 years (jobs)		51,946	51,770	57,198	59,136	57,844	74,976

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)		13,962	13,792	15,175	15,470	14,950	19,110
On-the-Job Training - All sectors - None (jobs)		12,581	12,334	13,575	14,011	13,648	18,097
On-the-Job Training - All sectors - Up to 1 year (jobs)		147,426	146,567	162,870	167,121	161,942	209,494
On-the-Job Training - All sectors - 1 to 4 years (jobs)		45,990	46,233	51,257	53,546	52,680	68,851
On-the-Job Training - All sectors - 4 to 10 years (jobs)		14,261	14,580	16,272	17,475	17,556	23,427
On-the-Job Training - All sectors - Over 10 years (jobs)		2,262	2,224	2,408	2,464	2,360	3,086
On-Site or In-Plant Training - All sectors - None (jobs)		36,261	36,000	39,934	41,324	40,274	52,867
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		133,672	132,933	147,644	151,673	147,132	190,491
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		35,921	36,061	39,979	41,645	40,857	53,331
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		14,894	15,122	16,765	17,781	17,739	23,397
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		1,770	1,821	2,059	2,194	2,184	2,870
Wage income - All (million $2019)		14,240	14,396	16,167	16,872	16,723	21,814

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	3,056	2,945	2,657	2,291	1,958	1,742	1,635
Final energy use - Residential (PJ)	878	820	708	579	478	418	385
Final energy use - Commercial (PJ)	793	798	775	732	700	692	702
Final energy use - Industry (PJ)	1,021	1,057	1,074	1,125	1,184	1,218	1,259

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)		12.6	13	29.3	31.6	24.6	25.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	2,562	4,931	7,300	15,592	23,885	30,512	37,138
Vehicle stocks - LDV – All others (1000 units)	30,967	29,487	28,006	20,409	12,812	7,249	1,685
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		5,550	15,540	23,053	35,766	38,007	36,736
Public EV charging plugs - DC Fast (1000 units)	4.35		11.9		38.9		60.4
Public EV charging plugs - L2 (1000 units)	21.5		285		934		1,452

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 (%)	5.99	23.4	70.8	81.7	82.3	82.2	82.2
Sales of space heating units - Electric Resistance (%)	16.4	23.7	15.2	13.3	13.2	13.3	13.4
Sales of space heating units - Gas (%)	74.3	47	10.3	1.95	1.53	1.52	1.52
Sales of space heating units - Fossil (%)	3.33	5.85	3.58	3.05	3	2.95	2.91

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	11.2	59.4	70.3	70.8	70.8	70.8
Sales of water heating units - Electric Resistance (%)	17.5	31.3	27.2	26.4	26.4	26.4	26.4
Sales of water heating units - Gas Furnace (%)	79.8	54.8	10.6	0.486	0.003	0	0
Sales of water heating units - Other (%)	2.7	2.75	2.76	2.79	2.8	2.82	2.83
Sales of cooking units - Electric Resistance (%)	40	52.8	91.9	99.6	100	100	100
Sales of cooking units - Gas (%)	60	47.2	8.07	0.406	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		27.7	36.5				

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 (%)	1.74	20.9	62.9	75.6	76.7	76.7	76.7
Sales of space heating units - Electric Resistance (%)	11.4	14.3	19.6	22.2	22.6	22.6	22.6
Sales of space heating units - Gas Furnace (%)	86.9	64.8	17.5	2.29	0.731	0.685	0.683
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.63	11.5	57.5	68	68.5	68.5	68.5
Sales of water heating units - Electric Resistance (%)	2.03	6.87	26.2	30.7	30.9	30.9	30.9
Sales of water heating units - Gas Furnace (%)	96.8	81	15.7	0.718	0.005	0	0
Sales of water heating units - Other (%)	0.501	0.619	0.623	0.624	0.623	0.624	0.625
Sales of cooking units - Electric Resistance (%)	27.5	41.7	78.2	85.4	85.8	85.8	85.8
Sales of cooking units - Gas (%)	72.5	58.3	21.8	14.6	14.2	14.2	14.2
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		120,478	131,958				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	55	55	0	0	0	0	0
Installed thermal - Natural gas (MW)	36,414	25,834	25,128	25,852	21,738	29,902	47,494
Installed thermal - Nuclear (MW)	2,323	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	10,012	15,483	20,658	26,842	34,107	42,472	52,234
Installed renewables - Solar - Base land use assumptions (MW)	30,573	39,450	45,561	51,303	67,404	79,769	103,103
Installed renewables - Wind - Base land use assumptions (MW)	7,005	7,005	7,005	7,005	7,005	7,005	7,044
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	76.3	76.3	76.3	76.3	435	760
Installed renewables - Solar - Constrained land use assumptions (MW)	31,528	39,912	48,016	57,728	71,295	84,010	106,674
Installed renewables - Wind - Constrained land use assumptions (MW)	7,089	7,089	7,124	7,124	7,350	7,531	8,263
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	39.9	39.9	39.9	87.6	468	750
Capital invested - Solar PV - Base (billion $2018)		11.9	7.32	6.33	16.7	12.1	21.6
Capital invested - Wind - Base (billion $2018)		0	0	0	0	0	0.054

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Offshore Wind - Base (billion $2018)		0.292	0	0	0	0.588	0.429
Capital invested - Solar PV - Constrained (billion $2018)		11.2	9.7	10.7	14.1	12.5	21
Capital invested - Wind - Constrained (billion $2018)		0	0.062	0	0.347	0.265	1.01
Capital invested - Offshore Wind - Constrained (billion $2018)		0.153	0	0	0.097	0.622	0.374

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	76,176	98,009	113,175	127,060	164,853	192,978	245,329
Wind - Base land use assumptions (GWh)	27,863	27,863	27,863	27,863	27,863	27,863	27,998
OffshoreWind - Base land use assumptions (GWh)	0	418	418	418	418	2,400	4,197
Solar - Constrained land use assumptions (GWh)	78,455	99,044	118,573	141,109	171,332	199,522	249,459
Wind - Constrained land use assumptions (GWh)	27,871	27,871	27,995	27,995	28,624	29,123	31,003
OffshoreWind - Constrained land use assumptions (GWh)	0	219	219	219	477	2,558	4,106

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)							-1,878
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-876
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-5,203
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-661
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,189
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-708
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-144
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-210
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,642
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,511
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,813
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-3,065
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-9,374
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-968
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,379
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,365
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-216

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,240
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,914
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,748
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-5,255
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-13,545
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,299
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,568
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,022
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-288
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,778
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,341
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,838
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							307
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							668
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,646
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							239
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)							101
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.51
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							13.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,572
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,556
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							460
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							690

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 - Extend rotation length (1000 hectares)							4,777
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							360
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)							147
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							98.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,166
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,712
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							613
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							711
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,907
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							479
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)							192
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							78.9
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,598
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,598

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)							0
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-2,030

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-23.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,054
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,034
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-47.2
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-4,082
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,925
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							36.9
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,962
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							3,813
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							73.8
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,887

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)		28.3	0.037	0.037	0.019	0.011	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		216	106	68.8	51.1	28.6	20.3
Premature deaths from air pollution - Mobile - On-Road (deaths)		3,611	3,710	3,661	3,339	2,685	1,852
Premature deaths from air pollution - Gas Stations (deaths)		32.8	33.5	32.8	29.6	23.6	16.3
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		551	504	443	350	236	137
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		10.1	9.19	8.33	7.47	6.61	5.74
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		24.9	24.5	23.8	21.4	17.3	13.4

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 - Coal (deaths)		1.8	1.76	1.72	1.67	1.61	1.53
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		252	261	257	231	185	136
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		46.9	40.8	36.1	31.7	27.5	23.5
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		84.2	76.3	68.9	61.4	53.8	46.2
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.44	0.06	0.059	0.057	0.054	0.05
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		163	151	133	119	107	76.6
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		251	0.33	0.328	0.173	0.099	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		1,910	936	610	452	254	180
Monetary damages from air pollution - Mobile - On-Road (million $2019)		32,107	32,984	32,552	29,690	23,875	16,465
Monetary damages from air pollution - Gas Stations (million $2019)		290	297	290	262	209	144
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,884	4,464	3,926	3,099	2,095	1,217
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		89.9	81.4	73.8	66.2	58.5	50.9
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		221	217	211	189	154	119
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		15.9	15.6	15.2	14.8	14.2	13.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		2,227	2,308	2,274	2,046	1,642	1,200
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		415	362	319	281	244	208
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		745	675	610	544	476	409
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		3.88	0.526	0.522	0.502	0.474	0.439
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,445	1,337	1,182	1,054	950	680

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		857	1,350	2,146	2,114	1,783	1,594
By economic sector - Construction (jobs)		59,717	70,439	77,189	84,636	99,338	139,510

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Manufacturing (jobs)		30,550	37,330	36,123	32,353	34,350	36,817
By economic sector - Mining (jobs)		32,954	26,612	22,096	17,197	13,252	7,756
By economic sector - Other (jobs)		8,248	10,112	12,240	14,870	19,220	32,669
By economic sector - Pipeline (jobs)		2,728	3,430	2,661	2,427	2,141	1,837
By economic sector - Professional (jobs)		28,963	33,920	40,554	46,224	55,220	76,895
By economic sector - Trade (jobs)		24,190	25,944	28,865	31,870	37,382	52,888
By economic sector - Utilities (jobs)		30,007	38,647	45,560	52,448	65,669	87,293
By resource sector - Biomass (jobs)		2,798	3,478	6,847	8,508	8,239	7,580
By resource sector - CO2 (jobs)		127	9,048	6,505	5,686	6,043	7,875
By resource sector - Coal (jobs)		21.8	7.3	0	0	0	0
By resource sector - Grid (jobs)		39,529	54,268	73,557	87,216	114,629	157,622
By resource sector - Natural Gas (jobs)		23,833	17,311	14,391	14,014	12,818	11,423
By resource sector - Nuclear (jobs)		691	0	0	0	0	0
By resource sector - Oil (jobs)		74,637	66,277	59,016	51,957	43,905	26,773
By resource sector - Solar (jobs)		61,872	68,901	76,057	85,821	104,480	176,428
By resource sector - Wind (jobs)		14,706	28,493	31,062	30,934	38,241	49,557
By education level - All sectors - High school diploma or less (jobs)		90,820	104,056	112,287	119,074	137,373	183,061
By education level - All sectors - Associates degree or some college (jobs)		65,962	76,272	82,754	88,711	103,793	140,425
By education level - All sectors - Bachelors degree (jobs)		48,049	52,752	56,355	59,212	67,462	87,682
By education level - All sectors - Masters or professional degree (jobs)		11,638	12,794	13,916	14,840	17,079	22,545
By education level - All sectors - Doctoral degree (jobs)		1,745	1,911	2,123	2,299	2,648	3,545
Related work experience - All sectors - None (jobs)		30,823	35,315	38,318	40,957	47,555	63,817
Related work experience - All sectors - Up to 1 year (jobs)		43,046	49,280	53,419	56,785	65,688	88,433
Related work experience - All sectors - 1 to 4 years (jobs)		79,648	89,950	96,965	102,904	118,688	157,258
Related work experience - All sectors - 4 to 10 years (jobs)		50,994	57,815	62,275	66,207	76,568	101,716
Related work experience - All sectors - Over 10 years (jobs)		13,704	15,424	16,458	17,284	19,857	26,034
On-the-Job Training - All sectors - None (jobs)		12,345	13,765	14,815	15,735	18,127	24,392
On-the-Job Training - All sectors - Up to 1 year (jobs)		144,657	163,556	176,319	186,564	214,745	284,158
On-the-Job Training - All sectors - 1 to 4 years (jobs)		45,049	51,687	55,813	59,612	69,389	93,081
On-the-Job Training - All sectors - 4 to 10 years (jobs)		13,955	16,276	17,862	19,491	22,976	31,484
On-the-Job Training - All sectors - Over 10 years (jobs)		2,209	2,500	2,628	2,735	3,119	4,143
On-Site or In-Plant Training - All sectors - None (jobs)		35,557	40,298	43,481	46,173	53,351	71,537
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		131,143	148,318	159,881	169,289	195,015	258,278
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		35,185	40,291	43,476	46,357	53,859	72,081
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		14,596	16,832	18,352	19,882	23,261	31,477
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		1,733	2,045	2,245	2,435	2,870	3,886
Wage income - All (million $2019)		13,992	16,001	17,530	18,903	22,122	29,618

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	3,060	2,970	2,767	2,590	2,445	2,267	2,054
Final energy use - Residential (PJ)	878	825	766	706	626	537	459
Final energy use - Commercial (PJ)	793	800	806	802	788	770	759
Final energy use - Industry (PJ)	1,021	1,058	1,081	1,146	1,217	1,253	1,293

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)		9.31	9.32	16.2	17	25.6	27.3

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	1,983	2,669	3,356	6,535	9,714	16,751	23,787
Vehicle stocks - LDV – All others (1000 units)	31,093	31,093	31,093	29,494	27,894	21,495	15,096
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	1,128	1,859	6,771	19,756	29,318
Public EV charging plugs - DC Fast (1000 units)	4.35		5.46		15.8		38.7
Public EV charging plugs - L2 (1000 units)	21.5		131		380		930

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 (%)	5.99	14.3	19.7	35.3	59.2	74.8	80.3
Sales of space heating units - Electric Resistance (%)	16.4	25.3	24.3	21.5	17.3	14.5	13.6
Sales of space heating units - Gas (%)	74.3	54.1	50	38	19.4	7.29	3.04
Sales of space heating units - Fossil (%)	3.33	6.29	6.05	5.3	4.13	3.36	3.07
Sales of water heating units - Electric Heat Pump (%)	0	1.93	7.42	23.2	47.5	63.3	68.9
Sales of water heating units - Electric Resistance (%)	17.5	32.1	31.6	30.2	28.2	26.9	26.5
Sales of water heating units - Gas Furnace (%)	79.8	63.2	58.2	43.8	21.5	6.93	1.83
Sales of water heating units - Other (%)	2.7	2.75	2.76	2.78	2.8	2.81	2.83
Sales of cooking units - Electric Resistance (%)	39.8	41.4	46.9	61.4	81.6	94.1	98.4
Sales of cooking units - Gas (%)	60.2	58.6	53.1	38.6	18.4	5.94	1.6
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		27.5	36.2				

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 (%)	1.74	13	17.8	31.6	53.4	68.7	74.5
Sales of space heating units - Electric Resistance (%)	11.4	13.3	14	15.8	18.8	21.2	22.2
Sales of space heating units - Gas Furnace (%)	86.9	73.7	68.3	52.6	27.8	10.2	3.31
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.63	2.65	7.89	23	46.1	61.3	66.6
Sales of water heating units - Electric Resistance (%)	2.03	3.16	5.36	11.7	21.4	27.8	30.1

Table 55: *E-B+ scenario - PILLAR 1: Efficiency/Electrification - Commercial (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	96.8	93.6	86.1	64.7	31.8	10.2	2.7
Sales of water heating units - Other (%)	0.501	0.619	0.623	0.624	0.623	0.624	0.625
Sales of cooking units - Electric Resistance (%)	27.5	31	36.1	49.7	68.6	80.2	84.3
Sales of cooking units - Gas (%)	72.5	69	63.9	50.3	31.4	19.8	15.7
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		120,137	130,140				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	55	55	0	0	0	0	0
Installed thermal - Natural gas (MW)	36,462	30,129	35,165	37,977	40,999	34,342	44,049
Installed thermal - Nuclear (MW)	2,323	0	0	0	0	0	0
Capital invested - Biomass power plant (billion $2018)	0	0.012	0.833	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0.105	0.017	0.003	0.03
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	1.31	0.033	0.129	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Biomass power plant (GWh)	0	22.5	1,658	1,658	1,658	1,658	1,658
Biomass w/ccu power plant (GWh)	0	0	1,475	1,512	1,657	1,657	1,657
Biomass w/ccu allam power plant (GWh)	0	0	0	105	122	125	155

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	2	2	2	2	2	2
Number of facilities - Power ccu (quantity)	0	0	4	6	7	7	7
Number of facilities - Allam power w ccu (quantity)	0	0	0	4	5	6	6
Number of facilities - Beccs hydrogen (quantity)	0	0	0	12	18	20	21
Number of facilities - Diesel (quantity)	0	0	0	2	2	2	2
Number of facilities - Diesel ccu (quantity)	0	0	0	4	5	6	6
Number of facilities - Pyrolysis (quantity)	0	0	0	2	2	2	2
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	4	5	6	6
Number of facilities - Sng (quantity)	0	2	2	2	2	2	2
Number of facilities - Sng ccu (quantity)	0	0	4	4	4	4	4
Conversion capital investment - Cumulative 5-yr (million $2018)		12.9	2,135	12,011	6,685	2,104	577
Biomass purchases (million $2018/y)		9.04	119	484	687	752	768

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	1.48	30.2	45	54.6	61
Annual - BECCS (MMT)		0	1.47	16.7	25.2	27.9	28.5
Annual - NGCC (MMT)		0	0.01	6.82	9.85	13	18.3
Annual - Cement and lime (MMT)		0	0	6.71	9.95	13.7	14.1
Cumulative - All (MMT)		0	1.48	31.7	76.7	131	192
Cumulative - BECCS (MMT)		0	1.47	18.1	43.4	71.3	99.8
Cumulative - NGCC (MMT)		0	0.01	6.83	16.7	29.6	47.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Cumulative - Cement and lime (MMT)		0	0	6.71	16.7	30.4	44.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	1,285	1,529	1,529	1,529	1,529
Spur (km)		0	772	3,598	4,559	5,016	5,868
All (km)		0	2,057	5,127	6,088	6,545	7,397
Cumulative investment - Trunk (million $2018)		0	4,920	5,686	5,686	5,686	5,686
Cumulative investment - Spur (million $2018)		0	423	2,309	3,082	3,425	3,978
Cumulative investment - All (million $2018)		0	5,343	7,995	8,768	9,111	9,664

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual (MMT)		0	0	34.2	57	61.1	75.2
Injection wells (wells)		0	0	66	96	128	182
Resource characterization, appraisal, permitting costs (million $2020)		250	918	1,410	1,410	1,410	1,410
Wells and facilities construction costs (million $2020)		0	0	1,946	2,887	3,828	5,460

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)							-1,878
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-876
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-5,203
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-661
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,189
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-708
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-144
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-210
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,642
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,511
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,813
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-3,065
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-9,374
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-968
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,379
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,365

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-216
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,240
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,914
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,748
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-5,255
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-13,545
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,299
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,568
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,022
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-288
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,778
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,341
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,838
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							307
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							668
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,646
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							239
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)							101
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.51
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							13.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,572
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,556
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							460

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 - Avoid deforestation (over 30 years) (1000 hectares)							690
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,777
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							360
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)							147
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							98.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,166
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,712
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							613
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							711
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,907
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							479
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)							192
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							78.9
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,598
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,598

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)							0

Table 63: *E-B+ 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)							-2,030
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-23.6
Carbon sink potential - Moderate deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-2,054
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-4,034
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-47.2
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)							-4,081
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,925
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							36.9
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0.126
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							10.6
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,973
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							9,415
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							73.8
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0.125

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							10.6
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							9,499

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)		49.2	25.9	13.3	9.76	8.97	8.47
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		202	135	168	191	214	200
Premature deaths from air pollution - Mobile - On-Road (deaths)		3,600	3,750	3,896	4,064	4,228	4,387
Premature deaths from air pollution - Gas Stations (deaths)		32.6	33.8	34.9	36.3	37.5	38.6
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		546	508	480	468	465	464
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		11	10.8	10.7	10.7	10.6	10.6
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		24.8	25.3	26.4	28	29.6	31.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		1.88	1.93	1.98	2.02	2.05	2.07
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		252	258	255	257	273	298
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		49	48.4	49	49.9	50.8	51.8
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		88	90.5	93.7	96.7	99.5	102
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		1.18	0.782	0.608	0.577	0.555	0.516
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		164	177	185	181	184	176
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		436	229	118	86.5	79.5	75
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		1,786	1,197	1,492	1,695	1,893	1,768
Monetary damages from air pollution - Mobile - On-Road (million $2019)		32,012	33,340	34,643	36,132	37,595	39,009
Monetary damages from air pollution - Gas Stations (million $2019)		289	299	309	321	332	341
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		4,837	4,502	4,253	4,145	4,119	4,112
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		97.2	95.8	95.2	94.6	94	93.5

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		220	224	234	248	262	277
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		16.6	17.1	17.5	17.8	18.1	18.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		2,233	2,287	2,253	2,277	2,418	2,639
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		434	429	434	442	450	458
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		779	801	830	856	881	902
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		10.4	6.9	5.37	5.09	4.9	4.56
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		1,453	1,569	1,645	1,612	1,636	1,564

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		832	785	780	704	704	732
By economic sector - Construction (jobs)		23,598	47,849	56,590	59,283	60,051	80,442
By economic sector - Manufacturing (jobs)		21,294	25,483	29,978	29,685	25,362	25,563
By economic sector - Mining (jobs)		33,101	27,503	22,809	18,565	15,356	11,875
By economic sector - Other (jobs)		1,079	6,716	8,854	9,984	11,000	19,603
By economic sector - Pipeline (jobs)		2,796	2,877	2,905	2,780	2,810	2,759
By economic sector - Professional (jobs)		15,891	23,752	27,567	29,779	31,137	42,119
By economic sector - Trade (jobs)		15,897	20,475	22,313	23,284	24,069	32,752
By economic sector - Utilities (jobs)		25,195	25,680	33,342	37,239	38,487	40,842
By resource sector - Biomass (jobs)		2,645	2,507	2,367	2,184	2,198	2,205
By resource sector - CO2 (jobs)		0	0.041	0.052	0.056	0.062	0.066
By resource sector - Coal (jobs)		21.8	7.3	0	0	0	0
By resource sector - Grid (jobs)		30,922	34,473	49,249	56,514	56,853	62,842
By resource sector - Natural Gas (jobs)		25,025	22,530	23,395	23,236	25,003	22,696
By resource sector - Nuclear (jobs)		691	0	0	0	0	0
By resource sector - Oil (jobs)		74,954	67,054	60,639	54,997	50,651	44,041
By resource sector - Solar (jobs)			45,721	57,544	59,376	61,189	111,259
By resource sector - Wind (jobs)		5,426	8,826	11,944	14,996	13,080	13,643
By education level - All sectors - High school diploma or less (jobs)		56,048	75,313	85,987	88,603	87,464	107,785
By education level - All sectors - Associates degree or some college (jobs)		40,741	54,595	62,967	65,480	65,146	81,018
By education level - All sectors - Bachelors degree (jobs)		33,691	40,082	43,954	44,687	43,895	52,576
By education level - All sectors - Masters or professional degree (jobs)		8,082	9,690	10,654	10,910	10,836	13,225
By education level - All sectors - Doctoral degree (jobs)		1,124	1,440	1,575	1,622	1,634	2,083
Related work experience - All sectors - None (jobs)		19,486	25,648	29,305	30,346	30,176	37,365
Related work experience - All sectors - Up to 1 year (jobs)		25,822	35,370	40,400	41,637	41,069	51,494
Related work experience - All sectors - 1 to 4 years (jobs)		52,196	66,380	74,798	76,943	76,120	92,912

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

Item	2020	2025	2030	2035	2040	2045	2050
Related work experience - All sectors - 4 to 10 years (jobs)		33,055	42,345	47,864	49,314	48,818	59,563
Related work experience - All sectors - Over 10 years (jobs)		9,126	11,375	12,770	13,063	12,792	15,353
On-the-Job Training - All sectors - None (jobs)		7,760	10,164	11,365	11,636	11,500	14,454
On-the-Job Training - All sectors - Up to 1 year (jobs)		94,278	120,279	135,611	139,302	137,306	167,813
On-the-Job Training - All sectors - 1 to 4 years (jobs)		28,247	37,337	42,711	44,220	43,916	53,982
On-the-Job Training - All sectors - 4 to 10 years (jobs)		8,096	11,538	13,422	14,081	14,245	17,953
On-the-Job Training - All sectors - Over 10 years (jobs)		1,304	1,800	2,029	2,063	2,007	2,485
On-Site or In-Plant Training - All sectors - None (jobs)		22,284	29,286	33,100	34,042	33,629	41,848
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		85,362	109,063	123,056	126,459	124,714	152,424
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		22,150	29,202	33,350	34,486	34,204	42,005
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		8,837	12,124	13,938	14,535	14,638	18,194
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		1,051	1,444	1,694	1,781	1,789	2,216
Wage income - All (million $2019)		9,296	11,835	13,505	14,094	14,170	17,379

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	3,057	2,998	2,847	2,765	2,800	2,893	3,001
Final energy use - Residential (PJ)	878	827	784	756	740	729	719
Final energy use - Commercial (PJ)	793	809	826	837	860	902	960
Final energy use - Industry (PJ)	1,021	1,088	1,143	1,208	1,279	1,368	1,470

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)		11.4	11.7	20.7	22	18.4	19.1

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 (%)	4.04	25.4	26.3	27.8	29.1	30.6	32.8
Sales of space heating units - Electric Resistance (%)	16.9	22.7	22.3	21.7	21	19.5	17.3
Sales of space heating units - Gas (%)	75.7	46.9	46.4	45.5	45	44.9	44.9
Sales of space heating units - Fossil (%)	3.38	4.97	5	5	4.95	4.95	4.96
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	17.5	32.2	32.2	32.2	32.2	32.1	32.1
Sales of water heating units - Gas Furnace (%)	79.8	65	65	65	65.1	65.1	65.1
Sales of water heating units - Other (%)	2.7	2.75	2.76	2.78	2.79	2.81	2.82
Sales of cooking units - Electric Resistance (%)	39.3	39.3	39.3	39.3	39.3	39.3	39.3
Sales of cooking units - Gas (%)	60.7	60.7	60.7	60.7	60.7	60.7	60.7

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		26.2	28.8				

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of space heating units - Electric Heat Pump (%)	1.74	24.2	61.6	69.2	69.7	69.7	69.6
Sales of space heating units - Electric Resistance (%)	11.4	15.3	21.9	26.1	29.1	29.6	29.7
Sales of space heating units - Gas Furnace (%)	86.9	60.6	16.5	4.65	1.21	0.731	0.683
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	0.63	0.808	0.81	0.813	0.819	0.823	0.824
Sales of water heating units - Electric Resistance (%)	2.03	2.38	2.39	2.4	2.4	2.4	2.41
Sales of water heating units - Gas Furnace (%)	96.8	96.2	96.2	96.2	96.2	96.1	96.1
Sales of water heating units - Other (%)	0.501	0.619	0.623	0.624	0.623	0.624	0.625
Sales of cooking units - Electric Resistance (%)	27.5	29	29	29	29	28.9	28.9
Sales of cooking units - Gas (%)	72.5	71	71	71	71	71.1	71.1
Commercial HVAC investment in 2020s - Cumulative 5-yr (million $2018)		119,229	123,203				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	55	55	0	0	0	0	0
Installed thermal - Natural gas (MW)	36,402	33,275	34,574	37,750	41,477	42,077	42,803
Installed thermal - Nuclear (MW)	2,323	0	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	10,012	15,483	20,658	26,842	34,107	42,472	52,234
Installed renewables - Solar - Base land use assumptions (MW)	26,297	26,297	26,297	28,497	30,380	30,380	30,380
Installed renewables - Wind - Base land use assumptions (MW)	7,081	7,081	7,081	7,081	7,081	7,081	7,081
Installed renewables - Offshore Wind - Base land use assumptions (MW)	0	76.3	76.3	76.3	76.3	178	178
Installed renewables - Solar - Constrained land use assumptions (MW)	582	582	582	582	582	582	582
Installed renewables - Wind - Constrained land use assumptions (MW)	2.8	2.8	2.8	2.8	2.8	2.8	2.8

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	66,975	66,975	66,975	72,358	76,986	76,986	76,986
Wind - Base land use assumptions (GWh)	28,124	28,124	28,124	28,124	28,124	28,124	28,124
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)	-13.7		-7.63				-6.35
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-1.79		-3				-3.16

Table 72: *REF scenario - PILLAR 6: Land sinks - Forests - REF only (continued)*

Item	2020	2025	2030	2035	2040	2045	2050
Business-as-usual carbon sink - Total (Mt CO2e/y)	-15.5		-10.6				-9.51

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)							-1,878
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-876
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-5,203
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-661
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-2,189
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-708
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-144
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-210
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-2,642
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-14,511
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-2,813
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-3,065
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-9,374
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-968
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-4,379
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-1,365
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-216
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,494
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-5,240
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-28,914
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-3,748
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-5,255
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-13,545
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-1,299
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-6,568
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-2,022
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-288

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,778
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-43,341
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-7,838
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							307
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							668
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							2,646
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							239
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)							101
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							9.51
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							13.7
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,572
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							5,556
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							460
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							690
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							4,777
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							360
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)							147
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							14.3
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							98.9
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							3,166
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							9,712

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 - Accelerate regeneration (1000 hectares)							613
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							711
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							6,907
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							479
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)							192
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							19
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							78.9
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							2,598
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							11,598