Net-Zero America - Washington 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)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.69	3.97	3.51	3.4	2.84	2.28
Premature deaths from air pollution - Mobile - On-Road (deaths)		125	121	95.3	57	26.7	10.7
Premature deaths from air pollution - Gas Stations (deaths)		7.1	6.76	5.26	3.18	1.55	0.706
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	14	9.21	4.86	2.13	0.726
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.18	2.53	1.75	1.07	0.567	0.245
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.74	1.51	1.17	0.828	0.546	0.373
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.114	0.113	0.111	0.108	0.105	0.101
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	15.4	12	8	4.83	2.55
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.36	0.297	0.241	0.189	0.139	0.093
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.24	1.07	0.905	0.731	0.552	0.372
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.16	0.02	0.019	0.017	0.016	0.016
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.7	15.3	14.5	11.6	8.95	5.75
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		63.6	0.071	0.07	0.053	0.033	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		59.3	35.2	31.1	30.1	25.2	20.2
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,113	1,077	847	507	238	95
Monetary damages from air pollution - Gas Stations (million $2019)		62.9	59.8	46.5	28.2	13.8	6.25
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		155	124	81.6	43.1	18.8	6.43
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		28.2	22.4	15.5	9.51	5.03	2.17
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		15.4	13.4	10.4	7.33	4.83	3.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.01	1	0.982	0.958	0.929	0.895
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		144	137	106	70.8	42.8	22.6

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)		3.19	2.63	2.14	1.67	1.23	0.822
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		10.9	9.48	8.01	6.47	4.88	3.29
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.41	0.176	0.166	0.149	0.14	0.137
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		140	136	129	103	79.5	51

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		125	284	128	99.8	154	650
By economic sector - Construction (jobs)		10,004	13,174	16,688	18,593	20,263	27,400
By economic sector - Manufacturing (jobs)		2,853	4,122	4,551	4,452	4,191	5,144
By economic sector - Mining (jobs)		2,249	1,645	1,105	712	448	269
By economic sector - Other (jobs)		1,263	1,591	2,065	2,576	3,057	5,022
By economic sector - Pipeline (jobs)		418	361	502	229	169	210
By economic sector - Professional (jobs)		4,930	7,144	9,136	11,380	13,451	19,002
By economic sector - Trade (jobs)		3,601	4,466	5,448	6,633	7,821	11,248
By economic sector - Utilities (jobs)		5,361	9,672	12,915	14,191	15,466	19,773
By resource sector - Biomass (jobs)		537	784	364	301	562	2,777
By resource sector - CO2 (jobs)		0	0	1,741	53.5	90	814
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		7,219	16,364	21,247	25,819	28,448	36,083
By resource sector - Natural Gas (jobs)		2,549	2,064	2,014	1,796	1,380	1,366
By resource sector - Nuclear (jobs)		606	596	346	0.015	0.019	0.038
By resource sector - Oil (jobs)		6,006	4,868	3,624	2,612	1,888	1,284
By resource sector - Solar (jobs)		8,316	7,934	9,168	10,070	10,937	19,893
By resource sector - Wind (jobs)		5,473	9,850	14,034	18,214	21,716	26,503
By education level - All sectors - High school diploma or less (jobs)		12,952	17,786	21,848	24,200	26,473	36,168
By education level - All sectors - Associates degree or some college (jobs)		9,543	13,395	16,877	18,961	20,966	28,518
By education level - All sectors - Bachelors degree (jobs)		6,455	8,733	10,670	12,063	13,451	18,339
By education level - All sectors - Masters or professional degree (jobs)		1,601	2,205	2,722	3,141	3,553	4,886
By education level - All sectors - Doctoral degree (jobs)		254	342	421	500	577	808
Related work experience - All sectors - None (jobs)		4,410	6,112	7,590	8,483	9,362	12,830
Related work experience - All sectors - Up to 1 year (jobs)		6,214	8,509	10,434	11,670	12,855	17,713
Related work experience - All sectors - 1 to 4 years (jobs)		11,109	15,300	18,909	21,210	23,456	31,961
Related work experience - All sectors - 4 to 10 years (jobs)		7,201	9,956	12,413	13,935	15,418	20,911
Related work experience - All sectors - Over 10 years (jobs)		1,870	2,582	3,192	3,567	3,929	5,303
On-the-Job Training - All sectors - None (jobs)		1,746	2,329	2,846	3,200	3,550	4,901
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,156	27,704	34,000	38,091	42,075	57,568

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)		6,458	9,018	11,344	12,693	13,998	18,936
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,137	3,002	3,848	4,331	4,799	6,504
On-the-Job Training - All sectors - Over 10 years (jobs)		308	407	500	549	598	809
On-Site or In-Plant Training - All sectors - None (jobs)		5,062	6,920	8,543	9,609	10,656	14,623
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,295	25,160	30,921	34,619	38,216	52,230
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,011	6,975	8,736	9,766	10,758	14,572
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,178	3,034	3,862	4,335	4,798	6,493
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		258	371	475	535	592	802
Wage income - All (million $2019)		1,949	2,740	3,444	3,914	4,387	6,040

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

Item	2020	2025	2030	2035	2040	2045	2050
Oil consumption - Annual (million bbls)		135	119	96.2	74.7	57.8	41.8
Oil consumption - Cumulative (million bbls)							2,955
Oil production - Annual (million bbls)		0	0	0	0	0	0
Natural gas consumption - Annual (tcf)		238	201	161	121	76.3	52.9
Natural gas consumption - Cumulative (tcf)							4,854
Natural gas production - Annual (tcf)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	656	650	592	519	454	412	391
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146
Final energy use - Industry (PJ)	342	354	359	361	368	377	387

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)		3.77	3.88	6.5	6.9	5.9	6.14

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	284	851	1,418	3,404	5,389	6,976	8,562
Vehicle stocks - LDV – All others (1000 units)	7,140	6,798	6,457	4,705	2,954	1,671	388
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381

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 (%)	14	25.2	47.6	59.1	60.7	60.7	60.6
Sales of space heating units - Electric Resistance (%)	35.6	41	35.5	30.7	30	30.2	30.3
Sales of space heating units - Gas (%)	41.5	20.6	6.9	1.33	0.7	0.659	0.662
Sales of space heating units - Fossil (%)	8.89	13.2	9.93	8.85	8.62	8.41	8.39
Sales of water heating units - Electric Heat Pump (%)	0	6.87	37.5	47.6	48.6	48.6	48.6
Sales of water heating units - Electric Resistance (%)	45.5	59.1	48.2	46.1	46.1	46.1	46.1
Sales of water heating units - Gas Furnace (%)	47.5	28.5	9.06	0.967	0.047	0	0
Sales of water heating units - Other (%)	6.95	5.52	5.27	5.27	5.28	5.27	5.28
Sales of cooking units - Electric Resistance (%)	70.6	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.4	23.2	3.96	0.2	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.12	4.1				

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 (%)	2.72	15.7	39.9	56.5	59	59.1	59.1
Sales of space heating units - Electric Resistance (%)	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Sales of space heating units - Gas Furnace (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Sales of water heating units - Electric Resistance (%)	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Sales of water heating units - Gas Furnace (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
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)		22,776	24,705				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,741	2,659	2,659	4,235	4,299	4,391	5,265
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	0	0.006	0.013	0.027
Installed renewables - Rooftop PV (MW)	1,788	2,755	3,680	4,796	6,121	7,666	9,495
Installed renewables - Solar - Base land use assumptions (MW)	695	695	695	695	695	695	695
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,388	3,866	4,313	4,773	5,279	5,320
Installed renewables - Solar - Constrained land use assumptions (MW)	674	674	674	674	674	674	674
Installed renewables - Wind - Constrained land use assumptions (MW)	3,421	3,421	4,686	6,666	14,261	20,324	21,419
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Wind - Base (billion $2018)		0	0.826	0.787	0.706	0.738	0.057
Capital invested - Solar PV - Constrained (billion $2018)		0.2	0	0	0	0	0
Capital invested - Wind - Constrained (billion $2018)		0	2.11	3.35	11.6	9.51	1.16
Capital invested - Biomass power plant (billion $2018)	0	0.003	0.249	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0	0.008	0.044
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0	0.02	0.172

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,419	1,419	1,419	1,419	1,419	1,419	1,419
Wind - Base land use assumptions (GWh)	11,561	11,561	13,217	14,787	16,215	17,781	17,905
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	1,371	1,371	1,371	1,371	1,371	1,371	1,371
Wind - Constrained land use assumptions (GWh)	11,682	11,682	15,810	21,726	43,208	59,787	62,739
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0
Biomass power plant (GWh)	0	6.64	495	495	495	495	495
Biomass w/ccu power plant (GWh)	0	0	0	0	0	22.3	216
Biomass w/ccu allam power plant (GWh)	0	0	0	0	0	7.51	51.1

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	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	0	1	8
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	0	1	2
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	0	1	3
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	1	1
Conversion capital investment - Cumulative 5-yr (million $2018)		3.83	277	22.3	0	927	8,114
Biomass purchases (million $2018/y)		49.2	148	149	149	200	644

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	3.35	3.32	4.6	15
Annual - BECCS (MMT)		0	0	0	0	1.17	11.5
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	3.35	6.67	11.3	26.3
Cumulative - BECCS (MMT)		0	0	0	0	1.17	12.7

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	675	675	675	675
Spur (km)		0	0	101	101	344	1,526
All (km)		0	0	776	776	1,019	2,201
Cumulative investment - Trunk (million $2018)		0	0	1,702	1,702	1,702	1,702
Cumulative investment - Spur (million $2018)		0	0	99.8	99.3	246	1,036
Cumulative investment - All (million $2018)		0	0	1,802	1,801	1,948	2,738

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-2,170
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,981
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
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)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,575
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)							2,798
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,033

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)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		7.04	3.76	2.59	1.98	1.6	1.65
Premature deaths from air pollution - Mobile - On-Road (deaths)		127	134	135	125	103	72.9
Premature deaths from air pollution - Gas Stations (deaths)		7.25	7.58	7.56	6.98	5.71	4.04
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.6	15.6	13.4	10.6	7.74	5.02
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.23	2.98	2.8	2.46	1.88	1.26

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.76	1.72	1.67	1.54	1.27	0.98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.114	0.113	0.111	0.108	0.105	0.101
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.4	17.7	18.2	17.2	14.6	11.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.36	0.319	0.284	0.251	0.219	0.189
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.24	1.15	1.06	0.966	0.864	0.758
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.15	0.02	0.02	0.019	0.016	0.01
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.7	14.8	13.4	12.2	11.2	8.05
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		63.6	0.071	0.07	0.053	0.033	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		62.4	33.3	23	17.6	14.2	14.7
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,133	1,189	1,198	1,115	917	648
Monetary damages from air pollution - Gas Stations (million $2019)		64.2	67.1	66.9	61.8	50.6	35.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		156	138	118	94.3	68.6	44.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		28.6	26.4	24.8	21.8	16.7	11.1
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		15.6	15.2	14.8	13.6	11.2	8.68
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.01	1	0.982	0.958	0.929	0.895
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		145	157	161	152	129	99.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		3.19	2.82	2.51	2.22	1.94	1.67
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		10.9	10.2	9.4	8.55	7.65	6.71
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.33	0.18	0.178	0.17	0.142	0.092
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		139	132	119	108	99.4	71.5

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		152	321	131	92.4	182	650
By economic sector - Construction (jobs)		9,925	13,317	16,154	17,774	22,499	31,560
By economic sector - Manufacturing (jobs)		2,875	4,260	4,171	4,331	5,216	6,185
By economic sector - Mining (jobs)		2,267	1,713	1,287	945	669	417
By economic sector - Other (jobs)		1,258	1,606	1,984	2,499	3,234	5,422
By economic sector - Pipeline (jobs)		420	361	673	279	244	337
By economic sector - Professional (jobs)		4,927	7,285	8,698	11,008	14,850	21,930
By economic sector - Trade (jobs)		3,603	4,580	5,345	6,584	8,683	12,936
By economic sector - Utilities (jobs)		5,107	9,627	11,687	12,705	17,845	23,665
By resource sector - Biomass (jobs)		578	863	436	389	776	2,684
By resource sector - CO2 (jobs)		0	0	2,985	91.7	154	1,396
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		6,660	16,308	17,762	22,782	32,850	43,096
By resource sector - Natural Gas (jobs)		2,549	1,936	1,673	1,697	1,725	1,451
By resource sector - Nuclear (jobs)		606	596	346	0.017	0.023	0.05
By resource sector - Oil (jobs)		6,063	5,158	4,384	3,611	2,871	2,009
By resource sector - Solar (jobs)		8,343	7,967	8,996	9,935	11,061	19,922
By resource sector - Wind (jobs)		5,638	10,242	13,549	17,712	23,985	32,546
By education level - All sectors - High school diploma or less (jobs)		12,842	18,047	20,861	23,091	29,957	41,963
By education level - All sectors - Associates degree or some college (jobs)		9,440	13,559	16,057	18,017	23,636	33,164
By education level - All sectors - Bachelors degree (jobs)		6,410	8,875	10,211	11,606	15,195	21,362
By education level - All sectors - Masters or professional degree (jobs)		1,590	2,240	2,597	3,017	3,992	5,681
By education level - All sectors - Doctoral degree (jobs)		254	348	406	486	642	933
Related work experience - All sectors - None (jobs)		4,368	6,197	7,244	8,088	10,575	14,894
Related work experience - All sectors - Up to 1 year (jobs)		6,170	8,642	9,958	11,161	14,501	20,492
Related work experience - All sectors - 1 to 4 years (jobs)		11,011	15,521	18,044	20,268	26,496	37,175
Related work experience - All sectors - 4 to 10 years (jobs)		7,133	10,090	11,847	13,296	17,401	24,356
Related work experience - All sectors - Over 10 years (jobs)		1,853	2,619	3,038	3,405	4,449	6,187
On-the-Job Training - All sectors - None (jobs)		1,735	2,366	2,731	3,079	3,994	5,667
On-the-Job Training - All sectors - Up to 1 year (jobs)		19,997	28,133	32,434	36,447	47,582	66,879
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,387	9,126	10,808	12,059	15,789	22,055
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,110	3,031	3,677	4,104	5,385	7,565
On-the-Job Training - All sectors - Over 10 years (jobs)		307	413	481	528	673	938
On-Site or In-Plant Training - All sectors - None (jobs)		5,027	7,025	8,168	9,201	11,999	16,954
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,143	25,541	29,491	33,107	43,221	60,692
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,958	7,062	8,325	9,286	12,142	16,963
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,152	3,066	3,696	4,118	5,392	7,559
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		255	375	451	506	668	935
Wage income - All (million $2019)		1,929	2,777	3,282	3,730	4,956	7,035

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	657	654	611	573	544	510	470
Final energy use - Residential (PJ)	246	227	207	188	169	150	133
Final energy use - Commercial (PJ)	160	163	165	166	164	162	160
Final energy use - Industry (PJ)	342	355	361	367	376	385	395

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)		2.95	2.96	4.08	4.22	5.76	6.07

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	220	385	551	1,319	2,086	3,785	5,484
Vehicle stocks - LDV – All others (1000 units)	7,169	7,169	7,169	6,800	6,431	4,956	3,481
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	239	450	1,569	4,778	7,016
Public EV charging plugs - DC Fast (1000 units)	0.551		1.02		3.86		10.1
Public EV charging plugs - L2 (1000 units)	2.37		24.5		92.8		244

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 (%)	14	21.3	23.9	31.4	44.1	54.1	58.4
Sales of space heating units - Electric Resistance (%)	35.6	41.8	41.1	39.2	35.8	32.7	31
Sales of space heating units - Gas (%)	41.5	23	21.5	17	9.58	4.03	1.76
Sales of space heating units - Fossil (%)	8.89	13.8	13.5	12.4	10.6	9.24	8.81
Sales of water heating units - Electric Heat Pump (%)	0	1.23	4.71	14.8	30.9	42.3	46.7
Sales of water heating units - Electric Resistance (%)	45.5	61.3	60	56.4	51	47.6	46.5
Sales of water heating units - Gas Furnace (%)	47.5	31.9	29.8	23.3	12.8	4.87	1.59
Sales of water heating units - Other (%)	6.95	5.56	5.52	5.49	5.39	5.31	5.28
Sales of cooking units - Electric Resistance (%)	70.4	71.2	73.9	81.1	91	97.1	99.2
Sales of cooking units - Gas (%)	29.6	28.8	26.1	18.9	9.03	2.91	0.784
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.1	4.04				

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 (%)	2.72	11.9	14.6	22.8	37.2	49.8	55.8
Sales of space heating units - Electric Resistance (%)	18.3	13.9	15.8	21.6	30.6	36.8	39.3
Sales of space heating units - Gas Furnace (%)	79	74.3	69.5	55.6	32.2	13.3	4.9
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.12	2.39	6.84	19.8	40.6	55.7	61.7
Sales of water heating units - Electric Resistance (%)	3.42	3.14	5.18	11.2	21.3	29.5	33.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Gas Furnace (%)	94.6	93.8	87.3	68.4	37.5	14.2	4.65
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
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)		22,723	24,348				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,745	2,659	2,659	3,254	3,569	5,123	4,999
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	0	0.007	0.016	0.035

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)							-1,087
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-2,170
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Mid - Increase trees outside forests (1000 hectares)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959

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
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,981
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
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)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,575
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)							2,798
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,033

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)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.23	2.96	1.9	1.73	1.47	0.472
Premature deaths from air pollution - Mobile - On-Road (deaths)		125	121	95.3	57	26.7	10.7
Premature deaths from air pollution - Gas Stations (deaths)		7.1	6.76	5.26	3.18	1.55	0.706
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	14	9.21	4.86	2.13	0.726
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.18	2.53	1.75	1.07	0.567	0.245
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.74	1.51	1.17	0.828	0.546	0.373
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.114	0.113	0.111	0.108	0.105	0.101
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	15.4	12	8	4.83	2.55

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.36	0.297	0.241	0.189	0.139	0.093
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.24	1.07	0.905	0.731	0.552	0.372
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.183	0.02	0.019	0.017	0.016	0.004
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.5	15.1	13.6	10.1	6.44	1.03
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		63.6	0.071	0.07	0.053	0.033	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		55.2	26.2	16.9	15.4	13	4.18
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,113	1,077	847	507	238	95
Monetary damages from air pollution - Gas Stations (million $2019)		62.9	59.8	46.5	28.2	13.8	6.25
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		155	124	81.6	43.1	18.8	6.43
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		28.2	22.4	15.5	9.51	5.03	2.17
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		15.4	13.4	10.4	7.33	4.83	3.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.01	1	0.982	0.958	0.929	0.895
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		144	137	106	70.8	42.8	22.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		3.19	2.63	2.14	1.67	1.23	0.822
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		10.9	9.48	8.01	6.47	4.88	3.29
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.61	0.177	0.164	0.147	0.137	0.037
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		138	134	121	89.8	57.2	9.15

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		126	261	125	84.1	134	648
By economic sector - Construction (jobs)		10,072	12,256	18,017	23,344	29,139	45,677
By economic sector - Manufacturing (jobs)		3,156	4,083	5,509	6,176	6,476	10,700
By economic sector - Mining (jobs)		2,237	1,618	1,045	623	290	17.4
By economic sector - Other (jobs)		1,273	1,545	2,272	3,056	3,979	7,751
By economic sector - Pipeline (jobs)		410	350	260	180	102	24
By economic sector - Professional (jobs)		5,003	6,929	10,701	14,958	20,089	32,195

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Trade (jobs)		3,629	4,343	6,200	8,411	11,220	18,618
By economic sector - Utilities (jobs)		5,223	7,381	13,283	18,474	24,121	35,916
By resource sector - Biomass (jobs)		490	737	335	275	496	2,851
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		6,928	11,713	23,908	34,123	45,335	68,554
By resource sector - Natural Gas (jobs)		2,466	2,075	1,837	1,563	1,235	1,101
By resource sector - Nuclear (jobs)		606	351	0	0	0	0
By resource sector - Oil (jobs)		6,007	4,817	3,512	2,362	1,227	2.34
By resource sector - Solar (jobs)		8,509	8,180	9,306	10,458	11,467	27,404
By resource sector - Wind (jobs)		6,025	10,892	18,513	26,525	35,791	51,634
By education level - All sectors - High school diploma or less (jobs)		13,084	16,173	23,725	30,778	38,667	61,500
By education level - All sectors - Associates degree or some college (jobs)		9,643	12,175	18,406	24,301	30,918	48,958
By education level - All sectors - Bachelors degree (jobs)		6,527	8,054	11,774	15,522	19,851	31,381
By education level - All sectors - Masters or professional degree (jobs)		1,617	2,037	3,027	4,056	5,264	8,346
By education level - All sectors - Doctoral degree (jobs)		257	327	479	649	852	1,360
Related work experience - All sectors - None (jobs)		4,449	5,552	8,249	10,816	13,719	21,831
Related work experience - All sectors - Up to 1 year (jobs)		6,290	7,811	11,433	14,890	18,783	30,086
Related work experience - All sectors - 1 to 4 years (jobs)		11,220	13,958	20,665	27,139	34,490	54,618
Related work experience - All sectors - 4 to 10 years (jobs)		7,274	9,089	13,564	17,873	22,747	35,854
Related work experience - All sectors - Over 10 years (jobs)		1,894	2,357	3,499	4,588	5,812	9,156
On-the-Job Training - All sectors - None (jobs)		1,765	2,154	3,120	4,077	5,170	8,286
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,386	25,339	37,261	48,754	61,796	98,297
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,517	8,179	12,328	16,250	20,649	32,505
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,146	2,715	4,154	5,524	7,065	11,078
On-the-Job Training - All sectors - Over 10 years (jobs)		314	381	546	701	871	1,380
On-Site or In-Plant Training - All sectors - None (jobs)		5,126	6,380	9,382	12,311	15,640	24,918
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,495	22,974	33,843	44,289	56,128	89,206
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,058	6,328	9,498	12,490	15,845	24,986
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,188	2,749	4,171	5,529	7,060	11,057
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		260	335	516	686	877	1,379
Wage income - All (million $2019)		1,965	2,486	3,756	5,013	6,472	10,340

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	656	650	592	519	454	412	391
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146
Final energy use - Industry (PJ)	342	354	359	361	368	377	387

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)		3.77	3.88	6.5	6.9	5.9	6.14

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	284	851	1,418	3,404	5,389	6,976	8,562
Vehicle stocks - LDV – All others (1000 units)	7,140	6,798	6,457	4,705	2,954	1,671	388
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381

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 (%)	14	25.2	47.6	59.1	60.7	60.7	60.6
Sales of space heating units - Electric Resistance (%)	35.6	41	35.5	30.7	30	30.2	30.3
Sales of space heating units - Gas (%)	41.5	20.6	6.9	1.33	0.7	0.659	0.662
Sales of space heating units - Fossil (%)	8.89	13.2	9.93	8.85	8.62	8.41	8.39
Sales of water heating units - Electric Heat Pump (%)	0	6.87	37.5	47.6	48.6	48.6	48.6
Sales of water heating units - Electric Resistance (%)	45.5	59.1	48.2	46.1	46.1	46.1	46.1
Sales of water heating units - Gas Furnace (%)	47.5	28.5	9.06	0.967	0.047	0	0
Sales of water heating units - Other (%)	6.95	5.52	5.27	5.27	5.28	5.27	5.28
Sales of cooking units - Electric Resistance (%)	70.6	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.4	23.2	3.96	0.2	0	0	0
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.12	4.1				

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 (%)	2.72	15.7	39.9	56.5	59	59.1	59.1
Sales of space heating units - Electric Resistance (%)	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Sales of space heating units - Gas Furnace (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Sales of water heating units - Electric Resistance (%)	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Sales of water heating units - Gas Furnace (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
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)		22,776	24,705				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,745	2,659	3,241	4,967	5,031	5,123	4,999
Installed thermal - Nuclear (MW)	1,200	1,200	0	0	0	0	0
Installed renewables - Rooftop PV (MW)	1,788	2,755	3,680	4,796	6,121	7,666	9,495
Installed renewables - Solar - Base land use assumptions (MW)	695	695	695	695	695	695	7,872
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,388	3,907	4,687	6,452	9,543	17,222
Installed renewables - Solar - Constrained land use assumptions (MW)	696	696	696	696	696	696	12,340
Installed renewables - Wind - Constrained land use assumptions (MW)	3,865	3,865	5,134	13,313	29,611	58,766	97,172
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0	6.65
Capital invested - Wind - Base (billion $2018)		0	0.898	1.32	2.71	4.51	10.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,419	1,419	1,419	1,419	1,419	1,419	15,515
Wind - Base land use assumptions (GWh)	11,561	11,561	13,355	15,953	21,315	30,373	52,064
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0
Solar - Constrained land use assumptions (GWh)	2,837	2,837	2,837	2,837	2,837	2,837	48,345
Wind - Constrained land use assumptions (GWh)	23,634	23,634	31,885	78,964	166,657	311,488	472,062
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-2,170
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959

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)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,981
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
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)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,575
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)							2,798
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,033

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)		7.18	0.008	0.008	0.006	0.004	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.53	3.13	3.7	4.37	2.73	1.29
Premature deaths from air pollution - Mobile - On-Road (deaths)		125	121	95.3	57	26.7	10.7
Premature deaths from air pollution - Gas Stations (deaths)		7.1	6.76	5.26	3.18	1.55	0.706
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	14	9.21	4.86	2.13	0.726
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.18	2.53	1.75	1.07	0.567	0.245
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.74	1.51	1.17	0.828	0.546	0.373
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.114	0.113	0.111	0.108	0.105	0.101
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.2	15.4	12	8	4.83	2.55
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.36	0.297	0.241	0.189	0.139	0.093
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.24	1.07	0.905	0.731	0.552	0.372
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.136	0.02	0.019	0.017	0.016	0.004
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.9	15.9	16.1	14	12	9.14
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		63.6	0.071	0.07	0.053	0.033	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		57.8	27.7	32.8	38.7	24.2	11.4
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,113	1,077	847	507	238	95
Monetary damages from air pollution - Gas Stations (million $2019)		62.9	59.8	46.5	28.2	13.8	6.25
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		155	124	81.6	43.1	18.8	6.43
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		28.2	22.4	15.5	9.51	5.03	2.17
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		15.4	13.4	10.4	7.33	4.83	3.3
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.01	1	0.982	0.958	0.929	0.895
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		144	137	106	70.8	42.8	22.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		3.19	2.63	2.14	1.67	1.23	0.822

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		10.9	9.48	8.01	6.47	4.88	3.29
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.2	0.175	0.165	0.148	0.14	0.036
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		141	141	143	124	106	81.2

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		143	340	126	92.2	163	652
By economic sector - Construction (jobs)		9,994	11,073	13,294	13,802	13,716	17,984
By economic sector - Manufacturing (jobs)		3,094	3,311	3,499	3,533	2,761	3,286
By economic sector - Mining (jobs)		2,261	1,665	1,150	766	510	351
By economic sector - Other (jobs)		1,253	1,407	1,678	2,055	2,365	3,938
By economic sector - Pipeline (jobs)		426	375	739	289	243	371
By economic sector - Professional (jobs)		4,823	5,765	6,207	7,415	8,107	11,221
By economic sector - Trade (jobs)		3,548	3,803	4,018	4,640	5,049	7,074
By economic sector - Utilities (jobs)		5,640	7,679	10,181	10,616	9,640	11,019
By resource sector - Biomass (jobs)		501	873	433	345	639	2,710
By resource sector - CO2 (jobs)		0	0	3,373	104	174	1,577
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		7,851	12,437	14,597	19,231	17,327	17,991
By resource sector - Natural Gas (jobs)		2,600	2,195	2,206	2,087	1,652	2,093
By resource sector - Nuclear (jobs)		606	596	346	0.028	0.043	0.668
By resource sector - Oil (jobs)		6,004	4,868	3,624	2,612	1,940	1,505
By resource sector - Solar (jobs)		8,538	7,842	8,769	9,682	10,732	19,592
By resource sector - Wind (jobs)		4,982	6,607	7,546	9,149	10,090	10,428
By education level - All sectors - High school diploma or less (jobs)		13,147	14,937	17,253	18,068	17,630	23,224
By education level - All sectors - Associates degree or some college (jobs)		9,674	11,096	13,157	13,911	13,688	17,899
By education level - All sectors - Bachelors degree (jobs)		6,504	7,275	8,144	8,672	8,629	11,305
By education level - All sectors - Masters or professional degree (jobs)		1,607	1,827	2,036	2,217	2,249	2,977
By education level - All sectors - Doctoral degree (jobs)		251	283	304	340	360	492
Related work experience - All sectors - None (jobs)		4,470	5,111	5,960	6,275	6,177	8,167
Related work experience - All sectors - Up to 1 year (jobs)		6,289	7,132	8,136	8,623	8,510	11,359
Related work experience - All sectors - 1 to 4 years (jobs)		11,244	12,765	14,694	15,543	15,316	20,059
Related work experience - All sectors - 4 to 10 years (jobs)		7,282	8,268	9,633	10,160	10,007	13,026
Related work experience - All sectors - Over 10 years (jobs)		1,896	2,143	2,471	2,607	2,546	3,286
On-the-Job Training - All sectors - None (jobs)		1,759	1,956	2,210	2,345	2,341	3,136
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,413	23,153	26,394	27,969	27,545	36,308
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,543	7,481	8,872	9,319	9,137	11,849
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,156	2,488	3,023	3,170	3,137	4,082

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

Item	2020	2025	2030	2035	2040	2045	2050
On-the-Job Training - All sectors - Over 10 years (jobs)		311	341	394	405	396	522
On-Site or In-Plant Training - All sectors - None (jobs)		5,112	5,775	6,610	7,001	6,955	9,238
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,532	21,022	24,039	25,454	25,040	32,941
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		5,079	5,797	6,838	7,189	7,042	9,148
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,197	2,519	3,035	3,173	3,134	4,070
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		262	306	371	392	385	500
Wage income - All (million $2019)		1,972	2,280	2,674	2,862	2,852	3,762

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	656	650	592	519	454	412	391
Final energy use - Residential (PJ)	246	227	199	170	144	128	117
Final energy use - Commercial (PJ)	160	162	160	153	146	145	146
Final energy use - Industry (PJ)	342	354	359	361	368	377	387

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)		3.77	3.88	6.5	6.9	5.9	6.14

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	284	851	1,418	3,404	5,389	6,976	8,562
Vehicle stocks - LDV – All others (1000 units)	7,140	6,798	6,457	4,705	2,954	1,671	388
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		1,331	3,547	5,529	8,462	9,115	8,742
Public EV charging plugs - DC Fast (1000 units)	0.551		2.62		9.97		15.8
Public EV charging plugs - L2 (1000 units)	2.37		63.1		240		381

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 (%)	14	25.2	47.6	59.1	60.7	60.7	60.6
Sales of space heating units - Electric Resistance (%)	35.6	41	35.5	30.7	30	30.2	30.3
Sales of space heating units - Gas (%)	41.5	20.6	6.9	1.33	0.7	0.659	0.662
Sales of space heating units - Fossil (%)	8.89	13.2	9.93	8.85	8.62	8.41	8.39
Sales of water heating units - Electric Heat Pump (%)	0	6.87	37.5	47.6	48.6	48.6	48.6
Sales of water heating units - Electric Resistance (%)	45.5	59.1	48.2	46.1	46.1	46.1	46.1
Sales of water heating units - Gas Furnace (%)	47.5	28.5	9.06	0.967	0.047	0	0
Sales of water heating units - Other (%)	6.95	5.52	5.27	5.27	5.28	5.27	5.28
Sales of cooking units - Electric Resistance (%)	70.6	76.8	96	99.8	100	100	100
Sales of cooking units - Gas (%)	29.4	23.2	3.96	0.2	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.12	4.1				

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 (%)	2.72	15.7	39.9	56.5	59	59.1	59.1
Sales of space heating units - Electric Resistance (%)	18.3	17.1	34.2	39.6	40.2	40.2	40.2
Sales of space heating units - Gas Furnace (%)	79	67.2	25.9	3.88	0.83	0.698	0.698
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.12	9.5	48.6	62.9	64.3	64.4	64.4
Sales of water heating units - Electric Resistance (%)	3.42	6.18	24.2	33.6	34.9	34.9	34.9
Sales of water heating units - Gas Furnace (%)	94.6	83.7	26.6	2.84	0.138	0	0
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
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)		22,776	24,705				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,717	2,469	2,469	2,987	2,322	1,631	4,997
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	0	0.012	0.028	0.316
Installed renewables - Rooftop PV (MW)	1,788	2,755	3,680	4,796	6,121	7,666	9,495
Installed renewables - Solar - Base land use assumptions (MW)	695	695	695	695	695	1,080	1,080
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,459	3,739	3,866	4,313	4,567	4,567
Installed renewables - Solar - Constrained land use assumptions (MW)	1,234	1,561	1,561	1,561	3,042	3,744	3,744
Installed renewables - Wind - Constrained land use assumptions (MW)	3,459	3,508	4,255	4,686	6,919	10,482	10,482
Installed renewables - Offshore Wind - Constrained land use assumptions (MW)	0	0	0	0	0	0	0
Capital invested - Solar PV - Base (billion $2018)		0	0	0	0	0.377	0
Capital invested - Wind - Base (billion $2018)		0.134	0.485	0.205	0.75	0.37	0
Capital invested - Solar PV - Constrained (billion $2018)		0.437	0	0	1.54	0.688	0
Capital invested - Wind - Constrained (billion $2018)		0.094	1.29	0.695	3.43	5.19	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,419	1,419	1,419	1,419	1,419	2,177	2,177
Wind - Base land use assumptions (GWh)	11,561	11,817	12,794	13,217	14,787	15,576	15,576
OffshoreWind - Base land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Constrained land use assumptions (GWh)	2,487	3,131	3,131	3,131	6,048	7,413	7,413
Wind - Constrained land use assumptions (GWh)	11,817	11,993	14,463	15,810	22,465	32,717	32,717
OffshoreWind - Constrained land use assumptions (GWh)	0	0	0	0	0	0	0

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-2,170
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959

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)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
Carbon sink potential - Moderate deployment - Total (1000 tCO2e/y)							-1,101
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,981
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,575
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)							2,798
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							3,033

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)		7.18	0.008	0.008	0.006	0.004	0
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		6.81	3.58	2.73	2.6	2.21	1.96
Premature deaths from air pollution - Mobile - On-Road (deaths)		127	134	135	125	103	72.9
Premature deaths from air pollution - Gas Stations (deaths)		7.25	7.58	7.56	6.98	5.71	4.04
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.6	15.6	13.4	10.6	7.74	5.02
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.23	2.98	2.8	2.46	1.88	1.26
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.76	1.72	1.67	1.54	1.27	0.98
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.114	0.113	0.111	0.108	0.105	0.101
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.4	17.7	18.2	17.2	14.6	11.2
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.36	0.319	0.284	0.251	0.219	0.189
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.24	1.15	1.06	0.966	0.864	0.758
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.158	0.02	0.02	0.019	0.018	0.017

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.7	14.8	13.4	12.2	11.2	8.05
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		63.6	0.071	0.07	0.053	0.033	0
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		60.3	31.8	24.2	23.1	19.6	17.4
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,133	1,189	1,198	1,115	917	648
Monetary damages from air pollution - Gas Stations (million $2019)		64.2	67.1	66.9	61.8	50.6	35.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		156	138	118	94.3	68.6	44.5
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		28.6	26.4	24.8	21.8	16.7	11.1
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		15.6	15.2	14.8	13.6	11.2	8.68
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.01	1	0.982	0.958	0.929	0.895
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		145	157	161	152	129	99.6
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		3.19	2.82	2.51	2.22	1.94	1.67
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		10.9	10.2	9.4	8.55	7.65	6.71
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		1.4	0.179	0.178	0.172	0.162	0.15
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		139	132	119	108	99.4	71.5

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

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		140	239	96.3	187	554	533
By economic sector - Construction (jobs)		9,974	13,448	15,721	15,433	18,431	26,127
By economic sector - Manufacturing (jobs)		2,892	4,279	3,850	3,424	4,206	5,167
By economic sector - Mining (jobs)		2,263	1,712	1,291	978	671	401
By economic sector - Other (jobs)		1,263	1,618	1,943	2,276	2,821	4,808
By economic sector - Pipeline (jobs)		417	361	685	287	243	334
By economic sector - Professional (jobs)		4,961	7,298	8,379	9,547	12,542	17,453
By economic sector - Trade (jobs)		3,620	4,617	5,198	5,824	7,297	10,537
By economic sector - Utilities (jobs)		5,132	9,717	11,209	10,323	13,770	18,902
By resource sector - Biomass (jobs)		555	642	326	783	2,563	2,513
By resource sector - CO2 (jobs)		0	0	3,064	94.1	158	1,433
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		6,721	16,461	16,700	18,122	25,182	33,896
By resource sector - Natural Gas (jobs)		2,518	1,942	1,716	1,704	1,428	1,564
By resource sector - Nuclear (jobs)		606	596	346	0.016	0.021	0.051
By resource sector - Oil (jobs)		6,063	5,158	4,384	3,743	2,894	1,935

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

Item	2020	2025	2030	2035	2040	2045	2050
By resource sector - Solar (jobs)		8,336	7,958	8,889	9,695	10,680	19,863
By resource sector - Wind (jobs)		5,763	10,533	12,947	14,138	17,628	23,058
By education level - All sectors - High school diploma or less (jobs)		12,887	18,113	20,125	19,885	24,854	34,500
By education level - All sectors - Associates degree or some college (jobs)		9,483	13,655	15,499	15,390	19,273	27,097
By education level - All sectors - Bachelors degree (jobs)		6,438	8,920	9,851	9,983	12,559	17,328
By education level - All sectors - Masters or professional degree (jobs)		1,598	2,250	2,505	2,597	3,307	4,587
By education level - All sectors - Doctoral degree (jobs)		255	350	392	424	541	750
Related work experience - All sectors - None (jobs)		4,385	6,225	6,992	6,956	8,743	12,210
Related work experience - All sectors - Up to 1 year (jobs)		6,194	8,671	9,601	9,628	12,101	16,835
Related work experience - All sectors - 1 to 4 years (jobs)		11,056	15,600	17,413	17,405	21,814	30,341
Related work experience - All sectors - 4 to 10 years (jobs)		7,165	10,156	11,438	11,385	14,242	19,839
Related work experience - All sectors - Over 10 years (jobs)		1,861	2,636	2,929	2,906	3,634	5,036
On-the-Job Training - All sectors - None (jobs)		1,742	2,378	2,639	2,665	3,329	4,653
On-the-Job Training - All sectors - Up to 1 year (jobs)		20,075	28,247	31,267	31,344	39,435	54,663
On-the-Job Training - All sectors - 1 to 4 years (jobs)		6,415	9,191	10,439	10,302	12,846	17,999
On-the-Job Training - All sectors - 4 to 10 years (jobs)		2,120	3,056	3,561	3,514	4,371	6,175
On-the-Job Training - All sectors - Over 10 years (jobs)		308	416	465	454	553	772
On-Site or In-Plant Training - All sectors - None (jobs)		5,048	7,058	7,882	7,918	9,928	13,852
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		18,215	25,653	28,436	28,459	35,770	49,621
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		4,979	7,110	8,039	7,942	9,905	13,859
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		2,162	3,090	3,579	3,530	4,388	6,167
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		256	378	436	431	543	762
Wage income - All (million $2019)		1,937	2,792	3,167	3,197	4,069	5,729

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	657	654	611	573	544	510	470
Final energy use - Residential (PJ)	246	227	207	188	169	150	133
Final energy use - Commercial (PJ)	160	163	165	166	164	162	160
Final energy use - Industry (PJ)	342	355	361	367	376	385	395

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)		2.95	2.96	4.08	4.22	5.76	6.07

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

Item	2020	2025	2030	2035	2040	2045	2050
Vehicle stocks - LDV – EV (1000 units)	220	385	551	1,319	2,086	3,785	5,484
Vehicle stocks - LDV – All others (1000 units)	7,169	7,169	7,169	6,800	6,431	4,956	3,481
Light-duty vehicle capital costs vs. REF - Cumulative 5-yr (million $2018)		0	239	450	1,569	4,778	7,016
Public EV charging plugs - DC Fast (1000 units)	0.551		1.02		3.86		10.1
Public EV charging plugs - L2 (1000 units)	2.37		24.5		92.8		244

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 (%)	14	21.3	23.9	31.4	44.1	54.1	58.4
Sales of space heating units - Electric Resistance (%)	35.6	41.8	41.1	39.2	35.8	32.7	31
Sales of space heating units - Gas (%)	41.5	23	21.5	17	9.58	4.03	1.76
Sales of space heating units - Fossil (%)	8.89	13.8	13.5	12.4	10.6	9.24	8.81
Sales of water heating units - Electric Heat Pump (%)	0	1.23	4.71	14.8	30.9	42.3	46.7
Sales of water heating units - Electric Resistance (%)	45.5	61.3	60	56.4	51	47.6	46.5
Sales of water heating units - Gas Furnace (%)	47.5	31.9	29.8	23.3	12.8	4.87	1.59
Sales of water heating units - Other (%)	6.95	5.56	5.52	5.49	5.39	5.31	5.28
Sales of cooking units - Electric Resistance (%)	70.4	71.2	73.9	81.1	91	97.1	99.2
Sales of cooking units - Gas (%)	29.6	28.8	26.1	18.9	9.03	2.91	0.784
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.1	4.04				

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 (%)	2.72	11.9	14.6	22.8	37.2	49.8	55.8
Sales of space heating units - Electric Resistance (%)	18.3	13.9	15.8	21.6	30.6	36.8	39.3
Sales of space heating units - Gas Furnace (%)	79	74.3	69.5	55.6	32.2	13.3	4.9
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.12	2.39	6.84	19.8	40.6	55.7	61.7
Sales of water heating units - Electric Resistance (%)	3.42	3.14	5.18	11.2	21.3	29.5	33.1
Sales of water heating units - Gas Furnace (%)	94.6	93.8	87.3	68.4	37.5	14.2	4.65
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
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)		22,723	24,348				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,744	2,659	2,600	3,431	3,569	3,661	5,305
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	0	0.007	0.015	0.034

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

Item	2020	2025	2030	2035	2040	2045	2050
Capital invested - Biomass power plant (billion $2018)	0	0.004	0.227	0	0	0	0
Capital invested - Biomass w/ccu allam power plant (billion $2018)	0	0	0	0	0.008	0	0
Capital invested - Biomass w/ccu power plant (billion $2018)	0	0	0	0	0.063	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	7.38	452	452	452	452	452
Biomass w/ccu power plant (GWh)	0	0	0	0	70.4	70.4	70.4
Biomass w/ccu allam power plant (GWh)	0	0	0	0	8.4	8.4	8.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Number of facilities - Power (quantity)	0	1	1	1	1	1	1
Number of facilities - Power ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Allam power w ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Beccs hydrogen (quantity)	0	0	0	0	1	6	7
Number of facilities - Diesel (quantity)	0	0	0	1	1	1	1
Number of facilities - Diesel ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Pyrolysis (quantity)	0	0	0	1	1	1	1
Number of facilities - Pyrolysis ccu (quantity)	0	0	0	0	1	1	1
Number of facilities - Sng (quantity)	0	1	1	1	1	1	1
Number of facilities - Sng ccu (quantity)	0	0	0	0	0	0	0
Conversion capital investment - Cumulative 5-yr (million $2018)		4.26	253	26.4	1,350	5,424	624
Biomass purchases (million $2018/y)		63.7	192	194	290	684	729

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

Item	2020	2025	2030	2035	2040	2045	2050
Annual - All (MMT)		0	0	3.35	5.03	12.1	13
Annual - BECCS (MMT)		0	0	0	1.71	8.69	9.49
Annual - NGCC (MMT)		0	0	0	0	0	0
Annual - Cement and lime (MMT)		0	0	3.35	3.32	3.42	3.53
Cumulative - All (MMT)		0	0	3.35	8.38	20.5	33.5
Cumulative - BECCS (MMT)		0	0	0	1.71	10.4	19.9
Cumulative - NGCC (MMT)		0	0	0	0	0	0
Cumulative - Cement and lime (MMT)		0	0	3.35	6.67	10.1	13.6

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

Item	2020	2025	2030	2035	2040	2045	2050
Trunk (km)		0	0	675	675	675	675
Spur (km)		0	0	101	309	811	1,013
All (km)		0	0	776	984	1,486	1,688
Cumulative investment - Trunk (million $2018)		0	0	1,702	1,702	1,702	1,702
Cumulative investment - Spur (million $2018)		0	0	98.6	233	611	741
Cumulative investment - All (million $2018)		0	0	1,800	1,935	2,313	2,443

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

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

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - Accelerate regeneration (1000 tCO2e/y)							-1,087
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-2,170
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							53.9
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959

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)							-0.035
Carbon sink potential - Moderate deployment - Cropland measures (1000 tCO2e/y)							-1,027
Carbon sink potential - Moderate deployment - Permanent conservation cover (1000 tCO2e/y)							-73.6
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)							-1,101
Carbon sink potential - Aggressive deployment - Corn-ethanol to energy grasses (1000 tCO2e/y)							-0.035
Carbon sink potential - Aggressive deployment - Cropland measures (1000 tCO2e/y)							-1,981

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Aggressive deployment - Permanent conservation cover (1000 tCO2e/y)							-147
Carbon sink potential - Aggressive deployment - Cropland to woody energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Pasture to energy crops (1000 tCO2e/y)							0
Carbon sink potential - Aggressive deployment - Total (1000 tCO2e/y)							-2,129
Land impacted for carbon sink - Moderate deployment - Corn-ethanol to energy grasses (1000 hectares)							0.062
Land impacted for carbon sink - Moderate deployment - Cropland measures (1000 hectares)							1,458
Land impacted for carbon sink - Moderate deployment - Permanent conservation cover (1000 hectares)							117
Land impacted for carbon sink - Moderate deployment - Cropland to woody energy crops (1000 hectares)							0.016
Land impacted for carbon sink - Moderate deployment - Pasture to energy crops (1000 hectares)							2.81
Land impacted for carbon sink - Moderate deployment - Total (1000 hectares)							1,578
Land impacted for carbon sink - Aggressive deployment - Corn-ethanol to energy grasses (1000 hectares)							0.062
Land impacted for carbon sink - Aggressive deployment - Cropland measures (1000 hectares)							6,909
Land impacted for carbon sink - Aggressive deployment - Permanent conservation cover (1000 hectares)							235
Land impacted for carbon sink - Aggressive deployment - Cropland to woody energy crops (1000 hectares)							0.016
Land impacted for carbon sink - Aggressive deployment - Pasture to energy crops (1000 hectares)							2.81
Land impacted for carbon sink - Aggressive deployment - Total (1000 hectares)							7,146

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)		30.6	22	4.05	3.18	2.91	2.73
Premature deaths from air pollution - Fuel Comb - Electric Generation - Natural Gas (deaths)		8.21	8.13	8.52	6.89	6.26	6.49
Premature deaths from air pollution - Mobile - On-Road (deaths)		127	135	143	152	161	171
Premature deaths from air pollution - Gas Stations (deaths)		7.22	7.64	8.03	8.48	8.92	9.35

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

Item	2020	2025	2030	2035	2040	2045	2050
Premature deaths from air pollution - Fuel Comb - Residential - Natural Gas (deaths)		17.4	15.8	14.3	13.5	13.2	13.1
Premature deaths from air pollution - Fuel Comb - Residential - Oil (deaths)		3.17	2.7	2.13	1.61	1.22	0.974
Premature deaths from air pollution - Fuel Comb - Residential - Other (deaths)		1.74	1.73	1.77	1.86	1.94	2.03
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Coal (deaths)		0.119	0.124	0.127	0.131	0.134	0.136
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (deaths)		16.4	17.8	18.3	19.2	21	23.6
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Oil (deaths)		0.376	0.377	0.383	0.392	0.402	0.413
Premature deaths from air pollution - Fuel Comb - Comm/Institutional - Other (deaths)		1.29	1.36	1.44	1.52	1.6	1.67
Premature deaths from air pollution - Industrial Processes - Coal Mining (deaths)		0.428	0.285	0.223	0.213	0.206	0.194
Premature deaths from air pollution - Industrial Processes - Oil & Gas Production (deaths)		15.8	17.1	18	17.8	18.2	17.4
Monetary damages from air pollution - Fuel Comb - Electric Generation - Coal (million $2019)		271	195	35.9	28.1	25.7	24.2
Monetary damages from air pollution - Fuel Comb - Electric Generation - Natural Gas (million $2019)		72.7	72	75.4	61	55.4	57.5
Monetary damages from air pollution - Mobile - On-Road (million $2019)		1,130	1,203	1,275	1,353	1,434	1,517
Monetary damages from air pollution - Gas Stations (million $2019)		63.9	67.7	71.1	75.1	79	82.8
Monetary damages from air pollution - Fuel Comb - Residential - Natural Gas (million $2019)		154	140	127	119	117	116
Monetary damages from air pollution - Fuel Comb - Residential - Oil (million $2019)		28.1	24	18.9	14.3	10.8	8.63
Monetary damages from air pollution - Fuel Comb - Residential - Other (million $2019)		15.4	15.3	15.7	16.4	17.2	18
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Coal (million $2019)		1.06	1.09	1.13	1.16	1.18	1.21
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Natural Gas (million $2019)		146	157	162	170	186	209
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Oil (million $2019)		3.33	3.34	3.39	3.47	3.56	3.66
Monetary damages from air pollution - Fuel Comb - Comm/Institutional - Other (million $2019)		11.4	12.1	12.8	13.5	14.1	14.8
Monetary damages from air pollution - Industrial Processes - Coal Mining (million $2019)		3.78	2.52	1.97	1.88	1.82	1.71

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

Item	2020	2025	2030	2035	2040	2045	2050
Monetary damages from air pollution - Industrial Processes - Oil & Gas Production (million $2019)		140	152	160	158	161	155

Table 65: *REF scenario - IMPACTS - Jobs*

Item	2020	2025	2030	2035	2040	2045	2050
By economic sector - Agriculture (jobs)		132	119	117	95.5	95.3	103
By economic sector - Construction (jobs)		4,244	8,397	9,225	11,196	11,188	14,918
By economic sector - Manufacturing (jobs)		1,713	2,262	2,803	3,073	2,466	2,681
By economic sector - Mining (jobs)		2,298	1,855	1,512	1,250	1,065	909
By economic sector - Other (jobs)		218	1,169	1,414	1,777	2,016	3,597
By economic sector - Pipeline (jobs)		428	435	436	421	429	432
By economic sector - Professional (jobs)		2,527	4,032	4,544	5,752	6,108	8,425
By economic sector - Trade (jobs)		2,201	3,080	3,318	3,995	4,277	6,106
By economic sector - Utilities (jobs)		4,196	4,669	5,530	7,655	6,734	7,109
By resource sector - Biomass (jobs)		511	478	444	397	406	413
By resource sector - CO2 (jobs)		0	0	0	0	0	0
By resource sector - Coal (jobs)		98.8	0	0	0	0	0
By resource sector - Grid (jobs)		5,308	6,129	7,603	12,354	11,137	11,435
By resource sector - Natural Gas (jobs)		2,605	2,660	2,931	2,822	2,566	2,750
By resource sector - Nuclear (jobs)		606	596	587	340	0.02	0.02
By resource sector - Oil (jobs)		6,133	5,324	4,742	4,422	4,228	4,093
By resource sector - Solar (jobs)			7,424	8,539	9,376	10,167	19,124
By resource sector - Wind (jobs)		2,697	3,407	4,055	5,502	5,875	6,464
By education level - All sectors - High school diploma or less (jobs)		7,385	10,976	12,183	14,793	14,368	18,447
By education level - All sectors - Associates degree or some college (jobs)		5,407	8,062	9,059	11,177	10,926	14,147
By education level - All sectors - Bachelors degree (jobs)		4,036	5,424	5,948	7,161	7,009	8,975
By education level - All sectors - Masters or professional degree (jobs)		986	1,343	1,479	1,804	1,790	2,326
By education level - All sectors - Doctoral degree (jobs)		145	211	231	278	285	385
Related work experience - All sectors - None (jobs)		2,563	3,744	4,175	5,110	4,997	6,461
Related work experience - All sectors - Up to 1 year (jobs)		3,454	5,236	5,816	7,045	6,882	8,970
Related work experience - All sectors - 1 to 4 years (jobs)		6,594	9,395	10,420	12,697	12,404	15,939
Related work experience - All sectors - 4 to 10 years (jobs)		4,229	6,069	6,743	8,241	8,045	10,308
Related work experience - All sectors - Over 10 years (jobs)		1,118	1,572	1,747	2,122	2,051	2,602
On-the-Job Training - All sectors - None (jobs)		1,003	1,473	1,620	1,945	1,915	2,527
On-the-Job Training - All sectors - Up to 1 year (jobs)		11,939	17,021	18,874	22,908	22,336	28,728
On-the-Job Training - All sectors - 1 to 4 years (jobs)		3,692	5,456	6,096	7,502	7,312	9,376
On-the-Job Training - All sectors - 4 to 10 years (jobs)		1,159	1,810	2,025	2,523	2,489	3,223
On-the-Job Training - All sectors - Over 10 years (jobs)		165	258	285	337	326	425
On-Site or In-Plant Training - All sectors - None (jobs)		2,894	4,257	4,724	5,721	5,609	7,317
On-Site or In-Plant Training - All sectors - Up to 1 year (jobs)		10,829	15,459	17,145	20,833	20,304	26,094

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

Item	2020	2025	2030	2035	2040	2045	2050
On-Site or In-Plant Training - All sectors - 1 to 4 years (jobs)		2,875	4,237	4,729	5,807	5,657	7,257
On-Site or In-Plant Training - All sectors - 4 to 10 years (jobs)		1,216	1,845	2,055	2,544	2,504	3,222
On-Site or In-Plant Training - All sectors - Over 10 years (jobs)		145	219	247	310	304	389
Wage income - All (million $2019)		1,161	1,666	1,872	2,321	2,292	2,962

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

Item	2020	2025	2030	2035	2040	2045	2050
Final energy use - Transportation (PJ)	656	659	625	605	608	624	642
Final energy use - Residential (PJ)	246	227	210	196	186	179	172
Final energy use - Commercial (PJ)	160	165	169	173	178	188	201
Final energy use - Industry (PJ)	342	367	387	404	428	457	490

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)		3.38	3.44	3.99	4.11	3.95	4.04

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 (%)	12.4	29.8	30.5	31.7	33.2	35.3	38.5
Sales of space heating units - Electric Resistance (%)	36.2	36.9	36.4	35.6	34.5	32.5	29.2
Sales of space heating units - Gas (%)	42.3	20.7	21.6	21.9	21.7	21.7	21.7
Sales of space heating units - Fossil (%)	9.05	12.7	11.5	10.8	10.6	10.5	10.6
Sales of water heating units - Electric Heat Pump (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Resistance (%)	45.5	61.7	61.7	61.6	61.6	61.6	61.6
Sales of water heating units - Gas Furnace (%)	47.5	32.7	32.8	32.8	32.8	32.8	32.8
Sales of water heating units - Other (%)	6.95	5.57	5.55	5.6	5.61	5.61	5.61
Sales of cooking units - Electric Resistance (%)	70.2	70.2	70.2	70.2	70.2	70.2	70.2
Sales of cooking units - Gas (%)	29.8	29.8	29.8	29.8	29.8	29.8	29.8
Residential HVAC investment in 2020s vs. REF - Cumulative 5-yr (billion $2018)		4.1	3.83				

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 (%)	2.72	21.4	53.8	64.1	65.2	65.3	65.3
Sales of space heating units - Electric Resistance (%)	18.3	16.1	25.2	30.3	33.5	33.9	34
Sales of space heating units - Gas Furnace (%)	79	62.5	21	5.54	1.3	0.744	0.697
Sales of space heating units - Fossil (%)	0	0	0	0	0	0	0
Sales of water heating units - Electric Heat Pump (%)	1.12	0.821	0.82	0.824	0.831	0.834	0.834
Sales of water heating units - Electric Resistance (%)	3.42	2.42	2.42	2.44	2.44	2.44	2.44
Sales of water heating units - Gas Furnace (%)	94.6	96.1	96.1	96.1	96.1	96.1	96.1

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

Item	2020	2025	2030	2035	2040	2045	2050
Sales of water heating units - Other (%)	0.885	0.628	0.63	0.632	0.632	0.63	0.631
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)		22,575	23,159				

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

Item	2020	2025	2030	2035	2040	2045	2050
Installed thermal - Coal (MW)	730	0	0	0	0	0	0
Installed thermal - Natural gas (MW)	2,737	2,659	2,659	3,670	2,865	2,393	2,986
Installed thermal - Nuclear (MW)	1,200	1,200	1,200	1,200	0	0.009	0.016
Installed renewables - Rooftop PV (MW)	1,788	2,755	3,680	4,796	6,121	7,666	9,495
Installed renewables - Solar - Base land use assumptions (MW)	567	567	567	567	567	567	567
Installed renewables - Wind - Base land use assumptions (MW)	3,388	3,388	3,388	3,388	3,702	3,776	3,776
Installed renewables - Solar - Constrained land use assumptions (MW)	128	128	128	128	128	128	128

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

Item	2020	2025	2030	2035	2040	2045	2050
Solar - Base land use assumptions (GWh)	1,419	1,419	1,419	1,419	1,419	1,419	1,419
Wind - Base land use assumptions (GWh)	11,561	11,561	11,561	11,561	12,666	12,919	12,919
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)	-27.2		-5.37				-4.47
Business-as-usual carbon sink - Retained in Hardwood Products (Mt CO2e/y)	-8.11		-13.6				-14.3
Business-as-usual carbon sink - Total (Mt CO2e/y)	-35.3		-19				-18.8

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)							-1,087
Carbon sink potential - Low - Avoid deforestation (1000 tCO2e/y)							-317
Carbon sink potential - Low - Extend rotation length (1000 tCO2e/y)							-3,647
Carbon sink potential - Low - Improve plantations (1000 tCO2e/y)							-2,076
Carbon sink potential - Low - Increase retention of HWP (1000 tCO2e/y)							-9,930
Carbon sink potential - Low - Increase trees outside forests (1000 tCO2e/y)							-377
Carbon sink potential - Low - Reforest cropland (1000 tCO2e/y)							-7,491
Carbon sink potential - Low - Reforest pasture (1000 tCO2e/y)							-188
Carbon sink potential - Low - Restore productivity (1000 tCO2e/y)							-1,869

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

Item	2020	2025	2030	2035	2040	2045	2050
Carbon sink potential - Low - All (not counting overlap) (1000 tCO2e/y)							-26,982
Carbon sink potential - Mid - Accelerate regeneration (1000 tCO2e/y)							-1,629
Carbon sink potential - Mid - Avoid deforestation (1000 tCO2e/y)							-1,111
Carbon sink potential - Mid - Extend rotation length (1000 tCO2e/y)							-6,570
Carbon sink potential - Mid - Improve plantations (1000 tCO2e/y)							-3,042
Carbon sink potential - Mid - Increase retention of HWP (1000 tCO2e/y)							-19,860
Carbon sink potential - Mid - Increase trees outside forests (1000 tCO2e/y)							-728
Carbon sink potential - Mid - Reforest cropland (1000 tCO2e/y)							-11,236
Carbon sink potential - Mid - Reforest pasture (1000 tCO2e/y)							-1,332
Carbon sink potential - Mid - Restore productivity (1000 tCO2e/y)							-3,707
Carbon sink potential - Mid - All (not counting overlap) (1000 tCO2e/y)							-49,216
Carbon sink potential - High - Accelerate regeneration (1000 tCO2e/y)							-2,170
Carbon sink potential - High - Avoid deforestation (1000 tCO2e/y)							-1,904
Carbon sink potential - High - Extend rotation length (1000 tCO2e/y)							-9,494
Carbon sink potential - High - Improve plantations (1000 tCO2e/y)							-4,080
Carbon sink potential - High - Increase retention of HWP (1000 tCO2e/y)							-29,790
Carbon sink potential - High - Increase trees outside forests (1000 tCO2e/y)							-1,078
Carbon sink potential - High - Reforest cropland (1000 tCO2e/y)							-14,981
Carbon sink potential - High - Reforest pasture (1000 tCO2e/y)							-2,477
Carbon sink potential - High - All (not counting overlap) (1000 tCO2e/y)							-71,521
Carbon sink potential - High - Restore productivity (1000 tCO2e/y)							-5,545
Land impacted for carbon sink potential - Low - Accelerate regeneration (1000 hectares)							178
Land impacted for carbon sink potential - Low - Avoid deforestation (over 30 years) (1000 hectares)							242
Land impacted for carbon sink potential - Low - Extend rotation length (1000 hectares)							1,855
Land impacted for carbon sink potential - Low - Improve plantations (1000 hectares)							752
Land impacted for carbon sink potential - Low - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - Low - Increase trees outside forests (1000 hectares)							53.9

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - Low - Reforest cropland (1000 hectares)							495
Land impacted for carbon sink potential - Low - Reforest pasture (1000 hectares)							12.2
Land impacted for carbon sink potential - Low - Restore productivity (1000 hectares)							1,112
Land impacted for carbon sink potential - Low - Total impacted (over 30 years) (1000 hectares)							4,699
Land impacted for carbon sink potential - Mid - Accelerate regeneration (1000 hectares)							266
Land impacted for carbon sink potential - Mid - Avoid deforestation (over 30 years) (1000 hectares)							250
Land impacted for carbon sink potential - Mid - Extend rotation length (1000 hectares)							3,348
Land impacted for carbon sink potential - Mid - Improve plantations (1000 hectares)							1,131
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)							78.2
Land impacted for carbon sink potential - Mid - Reforest cropland (1000 hectares)							743
Land impacted for carbon sink potential - Mid - Reforest pasture (1000 hectares)							88.2
Land impacted for carbon sink potential - Mid - Restore productivity (1000 hectares)							2,240
Land impacted for carbon sink potential - Mid - Total impacted (over 30 years) (1000 hectares)							8,144
Land impacted for carbon sink potential - High - Accelerate regeneration (1000 hectares)							355
Land impacted for carbon sink potential - High - Avoid deforestation (over 30 years) (1000 hectares)							258
Land impacted for carbon sink potential - High - Extend rotation length (1000 hectares)							4,841
Land impacted for carbon sink potential - High - Improve plantations (1000 hectares)							1,503
Land impacted for carbon sink potential - High - Increase retention of HWP (1000 hectares)							0
Land impacted for carbon sink potential - High - Increase trees outside forests (1000 hectares)							102
Land impacted for carbon sink potential - High - Reforest cropland (1000 hectares)							990
Land impacted for carbon sink potential - High - Reforest pasture (1000 hectares)							70.4

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

Item	2020	2025	2030	2035	2040	2045	2050
Land impacted for carbon sink potential - High - Restore productivity (1000 hectares)							1,838
Land impacted for carbon sink potential - High - Total impacted (over 30 years) (1000 hectares)							9,959